MTA Long Island Rail Road

East Side Access

Preliminary Draft Environmental Impact Statement

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United States Department of Transportation
Federal Transit Administration

Metropolitan Transportation Authority
State of New York

EAST SIDE ACCESS

DRAFT ENVIRONMENTAL IMPACT STATEMENT

IN
NEW YORK, QUEENS, AND BRONX COUNTIES, NEW YORK
AND
NASSAU AND SUFFOLK COUNTIES, NEW YORK

PREPARED BY
U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL TRANSIT ADMINISTRATION

AND

MTA / LONG ISLAND RAIL ROAD

Submitted pursuant to the National Environmental Policy Act of 1969, §102, 42 U.S.C. §4332; Federal Transit Laws, Title 49 U.S.C. Chapter 53, §5301(e), §5323(b), and §5324(b); Title 49 U.S.C. §303, formerly Department of Transportation Act of 1966, §4(f); National Historic Preservation Act of 1966, §106, 16 U.S.C. §470(f); Executive Order 11990 (Protection of Wetlands); Executive Order 12372 (Intergovernmental Review of Federal Programs); Executive Order 11988 (Flood Plain Management); and Executive Order 12898 (Environmental Justice) and all applicable laws, regulations, orders, and guidelines.

Date: ____________________

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Letitia Thompson
Regional Administrator, Region 2
Federal Transit Administration

Date: ____________________

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Anthony F. Japha
Chief Program Executive
MTA/Long Island Rail Road East Side Access

Table of Contents

Executive Summary **S-1**

1: Project Purpose and Need **1-1**
- A. Introduction 1-1
- B. Identification of the Proposed Action 1-1
- C. Problem Identification 1-2
  - Existing Regional Transportation Network 1-2
    - Transit Connections from North and East 1-2
    - Transit Connections from West of the Hudson 1-3
    - The Regional Highway Network 1-3
  - Long Island Transportation Corridor 1-4
    - Long Island Rail Road 1-4
    - New York City Transit Buses and Subways 1-6
    - Express Bus Services/Long Island Bus Services 1-6
    - East River Ferries 1-6
    - Highways and Bridges 1-6
  - Study Area Problems and Needs 1-7
    - Introduction 1-7
    - Capacity Problems and Needs 1-8
    - Travel Time Problems and Needs 1-11
    - Environmental Problems and Needs 1-13
    - Socioeconomic Problems and Needs 1-13
    - Solving the Problems and Meeting the Needs 1-14
  - Project Goals 1-15
    - Goals 1-15
    - Goal 1: Improve the Quality of Service and Reduce Travel Time Within the Corridor Between Long Island and East Midtown Manhattan 1-15
    - Goal 2: Relieve LIRR Train Congestion at Penn Station New York 1-15
    - Goal 3: Increase Mobility by Serving New Market Areas and Creating New Market Connections Within the Region 1-16
    - Goal 4: Attract New Ridership to Public Transportation by Increasing Mass Transportation Capacity 1-16
    - Goal 5: Relieve Serious Overcrowding on NYCT's Queens Boulevard Line and Flushing Line Subway Trains 1-16
    - Goal 6: Reduce Congestion on Area Highway Corridors 1-16
    - Goal 7: Promote and Reinforce Economic Development and the Quality of Life of the New York City Metropolitan Region 1-16
    - Goal 8: Conform to the New York State Air Quality Implementation Plan (SIP) as Required by the Clean Air Act Amendments of 1990 1-16
    - Goal 9: Preserve Operational Capabilities for Existing Operators 1-17

E. Project Background, Prior Studies, and Current Planning Context 1-17
    Prior Studies 1-17
  Project Background 1-17
  Current Planning Context 1-19
    MTA Long-Range Planning Framework 1-19
    Potential Effects of the Proposed Action on Other Potential Transportation Providers 1-21
    Other MTA Projects 1-22
    Highway Projects on Long Island 1-24
    Other Transportation Projects in the Metropolitan Area 1-25
    Regional Transportation Plans in the Metropolitan Area 1-26

2: Project Alternatives 2-1
A. Introduction 2-1
B. No Action Alternative 2-1
C. Transportation Systems Management (TSM) Alternative 2-3
  Increasing LIRR Train Length 2-3
  Increasing Service at Hunterspoint Avenue and Long Island City 2-3
    Improvements at the LIRR Hunterspoint Avenue Station 2-4
    Improvements at the LIRR Long Island City Station 2-4
  Contraflow Bus/Taxi Lane 2-5
  Costs 2-6
D. Preferred Alternative 2-7
  Overview 2-7
  Grand Central Terminal 2-7
    Grand Central Terminal Today 2-7
    East Side Access at Grand Central Terminal 2-8
  Manhattan Track Alignment 2-10
    Project Route Today 2-10
    East Side Access Route 2-11
  63rd Street Tunnel 2-12
  Queens Track Alignment 2-12
    Existing Sunnyside Train Facilities 2-12
    East Side Access Route in Queens 2-13
    Midday Train Storage Facilities at Yard A 2-14
  New Sunnyside Station 2-14
  Extension of NYCT Lines from Existing Bellmouth 2-15
  Harold Interlocking Improvements 2-15
  Other Project Components 2-15
    Substations 2-15
    Ventilation 2-16
  Replacement Maintenance and Storage Facilities 2-17
    Relocation of Metro-North to Highbridge Yard 2-17
    Relocation of New York & Atlantic Railway 2-18
  Costs 2-19

3: Land Use, Zoning, and Public Policy 3-1
A. Introduction 3-1
B. History of Transportation and Land Use Patterns 3-2
  The LIRR and Long Island 3-2
  Penn Station, Grand Central Terminal, and Manhattan 3-3
    The Great Terminals 3-3
    Manhattan 3-5
  Long Island City/Sunnyside 3-6
C. Existing Conditions 3-7
  Regional Overview 3-7
  Manhattan Study Area 3-7
    Land Use 3-8
    Zoning 3-15
  Long Island City/Sunnyside Study Area 3-16
    Land Use 3-16
    Zoning and Public Policy 3-16
  Long Island 3-17
    Nassau County 3-17
    Suffolk County 3-19
  Yard Study Areas 3-21
    Blissville Yard 3-21
    Maspeth Yard 3-21
    Fresh Pond Yard 3-22
    Highbridge Yard 3-23
D. Future Conditions Common to All Alternatives 3-24
  Manhattan Study Area 3-24
    Lower Manhattan Subarea 3-24
    Village Subarea 3-25
    Chelsea Subarea 3-26
    Lower Fifth Subarea 3-26
    Midtown South Subarea 3-26
    Garment Center 3-26
    Clinton 3-27
    Midtown 3-27
    East Midtown 3-27
    Lincoln Square 3-28
    Upper East Side 3-28
  Long Island City/Sunnyside Study Area 3-28
  Yards: Blissville, Maspeth, Fresh Pond, and Highbridge 3-29
  Long Island 3-29

E. Probable Impacts of the Project Alternatives 3-29
No Action Alternative 3-30
Transportation Systems Management (TSM) Alternative 3-30
Preferred Alternative 3-31
Manhattan Study Area 3-31
Long Island City/Sunnyside Study Area 3-32
Long Island 3-33
Yard Study Areas 3-33
Mitigation 3-34

4: Social Conditions 4-1
A. Introduction 4-1
B. Existing Conditions 4-1
Long Island Transportation Corridor Overview 4-1
Manhattan Study Area 4-2
Neighborhood Character and Community Facilities 4-2
Population Characteristics 4-4
Long Island City/Sunnyside Study Area 4-5
Neighborhood Character and Community Facilities 4-5
Population Characteristics 4-7
Long Island 4-8
Neighborhood Character and Community Facilities 4-8
Population and Labor Force 4-9
Yards Study Areas 4-11
Blissville Yard 4-11
Maspeth Yard 4-12
Fresh Pond Yard 4-13
Highbridge Yard 4-14
C. Future Conditions Common to All Alternatives 4-15
Long Island Transportation Corridor Overview 4-15
Manhattan Study Area 4-18
Neighborhood Character and Community Facilities 4-18
Population and Labor Force 4-19
Long Island City/Sunnyside Study Area 4-20
Neighborhood Character and Community Facilities 4-20
Population 4-20
Long Island 4-20
Neighborhood Character and Community Facilities 4-20
Population and Labor Force 4-21
Yards 4-21
D. Probable Impacts of Project Alternatives 4-21
No Action Alternative 4-21
Transportation Systems Management (TSM) Alternative 4-22

Preferred Alternative 4-22
  Long Island Transportation Corridor 4-22
  Manhattan Study Area 4-23
  Long Island City/Sunnyside Study Area 4-23
  Long Island 4-24
  Yards Study Areas 4-24
Mitigation 4-25

5: Economic Conditions 5-1
A. Introduction 5-1
B. Regional Overview 5-1
  Post-War Trends 5-1
    New York City 5-2
    Nassau and Suffolk Counties 5-2
    New York's Role as an International Business Center 5-3
    Relationship of Transportation and Economic Conditions 5-4
C. Existing Conditions 5-5
  Long Island Transportation Corridor 5-5
    Employment Trends 5-5
    Real Estate Trends 5-6
  Manhattan Study Area 5-7
    Employment Trends 5-7
    Real Estate Trends 5-10
  Long Island City/Sunnyside Study Area 5-11
    Employment Trends 5-11
    Real Estate Trends 5-12
  Long Island 5-13
    Employment Trends 5-13
    Real Estate Trends 5-13
  Yards Study Areas 5-15
    Blissville Yard 5-15
    Maspeth Yard 5-16
    Fresh Pond Yard 5-16
    Highbridge Yard 5-16
D. Future Conditions Common to All Alternatives 5-16
  Overview of the Long Island Transportation Corridor 5-16
  Manhattan Study Area 5-17
  Long Island City/Sunnyside Study Area 5-18
  Long Island 5-19
  Yards Study Areas 5-19
E. Probable Impacts of Project Alternatives 5-19
  No Action Alternative 5-19
  Transportation Systems Management (TSM) Alternative 5-20

Preferred Alternative 5-21
LITC and Manhattan Study Areas 5-22
Long Island City/Sunnyside 5-23
Long Island 5-23
Yards Study Areas 5-24
Direct Displacement 5-24
Subsurface Easements Required 5-33
F. Mitigation Measures 5-33

6: Visual and Aesthetic Considerations 6-1
A. Introduction and Methodology 6-1
B. Existing Conditions 6-2
Manhattan Elements 6-2
Grand Central Terminal 6-2
Other Areas in Manhattan 6-3
Queens Elements 6-5
TSM Elements 6-5
Preferred Alternative, the Yards: Yard A, Sunnyside Yard, and the Amtrak/LIRR Tracks 6-7
Other Preferred Alternative Queens Elements 6-8
Blissville Yard, Queens 6-10
Affected Area 6-10
Visual Context 6-11
Maspeth Yard, Queens 6-11
Affected Area 6-11
Visual Context 6-12
Fresh Pond Yard, Queens 6-12
Affected Area 6-12
Visual Context 6-12
Highbridge Yard, the Bronx 6-13
Affected Area 6-13
Visual Context 6-13
C. Future Conditions Common to All Alternatives 6-14
Manhattan Elements 6-14
Queens Elements 6-15
Blissville, Maspeth, Fresh Pond, and Highbridge Yards 6-15
D. Probable Impacts of the Project Alternatives 6-15
No Action Alternative 6-15
TSM Alternative 6-16
Preferred Alternative 6-17
Manhattan Elements 6-17
Queens Elements 6-19
Blissville Yard, Queens 6-20
Maspeth Yard, Queens 6-20
Fresh Pond Yard, Queens 6-21
Highbridge Yard, the Bronx 6-21
E. Mitigation Measures 6-22

7: Historic Resources 7-1
A. Introduction and Methodology 7-1
Definition of the Area of Potential Effect 7-2
Inventory of Historic Properties/Structures Within the APEs 7-3
Potential Impacts on Historic Resources 7-4
B. Background History 7-4
Manhattan 7-4
Sunnyside Yard, Queens 7-6

C. Existing Conditions 7-7
TSM Alternative 7-7
Manhattan Alignment 7-8
Known Historic Resources 7-8
Potential Historic Resources Determined Eligible for Listing on the S/NR . 7-11
Potential Historic Resources 7-12
Queens Alignment 7-14
Known Historic Resources 7-14
Potential Historic Resources Determined Eligible for Listing on the S/NR . 7-14
Highbridge Yard, the Bronx 7-15
Known Historic Resources 7-15
D. Future Conditions Common to All Alternatives 7-16
E. Probable Impacts of the Project Alternatives 7-16
No Action Alternative 7-17
TSM Alternative 7-17
Preferred Alternative 7-17
Manhattan Alignment: Grand Central Terminal 7-17
Manhattan Alignment: Other Historic Resources 7-20
Queens Alignment 7-21
Highbridge Yard, the Bronx 7-22
F. Mitigation 7-22
G. Sources Consulted to Identify Potential Historic Resources 7-23
Other Sources Consulted 7-23

8: Archaeological Resources 8-1
A. Introduction and Methodology 8-1
Definition of the Area of Potential Effect (APE) 8-2
TSM Alternative 8-2
Preferred Alternative 8-3
Determination of the Likelihood of Encountering Archaeological Resources Within the APEs 8-4
Prehistoric Potential 8-4
Historic-Period Potential 8-4
Documentation of Disturbance and Identification of Potential Undisturbed Resources 8-5
Assessment of Project Impacts and Identification of Mitigation 8-5

B. Existing Conditions 8-5
  Manhattan Alignment 8-6
    Proposed Tunnel West of Park Avenue Between East 52nd and 55th Streets; Proposed Ventilation Facilities on East 53rd, 54th, and 55th Streetbeds Between Lexington and Madison Avenues East and West of Park Avenue Queens Alignment, Including Proposed TSM Alternative Tunnel at Hunters Point Avenue 8-6
    Pedestrian Entrance at 347 Madison Avenue and Ventilation Plant at 47 East 44th Street 8-7
  Queens Alignment, Including Proposed TSM Alternative Connection at Hunters Point Avenue 8-7
    Potential Resources 8-7
    Documentation of Disturbance/Identification of Potential Undisturbed Resources 8-9
  Roosevelt Island 8-10
    Potential Resources 8-10
    Documentation of Disturbance/Identification of Potential Undisturbed Resources 8-11
  Blissville Yard, Queens 8-11
    Potential Resources 8-11
    Documentation of Disturbance/Identification of Potential Undisturbed Resources 8-12
  Maspeth Yard, Queens 8-12
    Potential Resources 8-12
    Documentation of Disturbance/Identification of Potential Undisturbed Resources 8-12
  Fresh Pond Yard, Queens 8-13
    Potential Resources 8-13
    Documentation of Disturbance/Identification of Potential Undisturbed Resources 8-13
  Highbridge Yard, the Bronx 8-14
    Potential Resources 8-14
    Documentation of Disturbance/Identification of Potential Undisturbed Resources 8-14
C. Future Conditions Common to All Alternatives 8-15
D. Probable Impacts of the Project Alternatives 8-15
  No Action Alternative 8-15
  TSM Alternative 8-15
  Preferred Alternative 8-15
    Manhattan Alignment 8-16
    Queens Alignment, Including Proposed TSM Alternative Connection at Hunters Point Avenue 8-16
    Roosevelt Island and Blissville, Maspeth, Fresh Pond, and Highbridge Yards 8-17
E. Mitigation Measures 8-17

9: Transportation 9A-1
A. Introduction and Summary of Key Findings 9A-1
Introduction 9A-1
Summary of Key Findings 9A-2
Regional Traffic Impacts 9A-2
Grand Central Terminal Area 9A-2
Sunnyside/Long Island City Area 9A-4
Eastern Queens and Long Island 9A-5
B. Regional Issues 9B-1
Existing Regional Travel Patterns 9B-1
Long Island Rail Road 9B-1
New York City Transit Buses and Subways 9B-1
Highways and Bridges 9B-2
Other Regional Transportation Providers 9B-2
Future Regional Travel Common to All Project Alternatives 9B-2
Probable Impacts of the Project Alternatives 9B-2
Ridership Forecasting 9B-2
Operating Plan 9B-3
Future Station Utilization 9B-4
Regional Vehicular Traffic 9B-5
Subway Ridership 9B-7
Summary 9B-8
C. Grand Central Terminal (GCT) Area 9C-1
Existing Conditions 9C-1
Traffic 9C-1
Parking 9C-3
Commuter Rail 9C-5
Pedestrian Conditions Within GCT 9C-7
Lexington Avenue Subway Conditions 9C-13
Lexington Avenue Subway Line-Haul Capacity 9C-16
Pedestrian Conditions at Street Level 9C-19
Buses 9C-23
Future Conditions Common to All Alternatives 9C-24
Traffic 9C-24
Commuter Rail—Metro-North 9C-25
Pedestrian Conditions 9C-25
Probable Impacts of Project Alternatives 9C-27
No Action Alternative 9C-27
Preferred Alternative (Option 1) 9C-43
Preferred Alternative (Option 2) 9C-94
TSM Alternative 9C-95
Mitigation Summary 9C-95

D. Sunnyside/Long Island City Area 9D-1
Existing Conditions 9D-1
Traffic 9D-1
Parking 9D-2
Pedestrians 9D-2
Subways 9D-3
Buses 9D-3
Amtrak/NJ Transit 9D-4
Future Conditions Common to All Alternatives 9D-4
Projected Impacts of Project Alternatives 9D-4
No Action Alternative 9D-4
Preferred Alternative 9D-5
TSM Alternative 9D-6
Mitigation 9D-6
E. Eastern Queens and Long Island 9E-1
Existing Conditions 9E-1
Traffic 9E-1
Future Conditions Common to All Alternatives 9E-9
Probable Impacts of Project Alternatives 9E-13
No Action Alternative 9E-13
Preferred Alternative 9E-18
TSM Alternative 9E-36
Mitigation 9E-37

10: Air Quality 10-1
A. Introduction and Methodology 10-1
Pollutants for Analysis 10-1
Carbon Monoxide 10-1
Nitrogen Oxides and Ozone 10-2
Lead 10-2
Respirable Particulates—PM_{10} 10-2
Sulfur Dioxide 10-3
Air Quality Standards 10-3
National and State Air Quality Standards 10-3
State Implementation Plan (SIP) 10-5
De Minimis Criteria 10-5
Conformity with New York State Air Quality Implementation Plan 10-6
Methodology for Predicting Pollutant Concentrations from Mobile Sources 10-6
Dispersion Models for Microscale Analyses 10-7
Worst-case Meteorological Conditions 10-7
Vehicle Emissions Data 10-7
Background Concentrations 10-8
Mobile Source Receptor Locations 10-8
Parking Facilities 10-11
B. Existing Conditions 10-11
Existing Monitored Air Quality Conditions (1997) 10-11

C. Probable Impacts of the Project Alternatives 10-12
  Carbon Monoxide Analysis 10-12
    No Action Alternative 10-13
    Preferred Alternative 10-13
    TSM Alternative 10-13
  Regional (Mesoscale) Pollutant Impacts 10-14
  Particulate Impacts from Yard Activity 10-15
  HVAC System 10-15
D. Mitigation Measures 10-15
  Consistency with the New York State Air Quality Implementation Plan 10-16

11: Noise and Vibration 11-1
A. Introduction 11-1
B. Noise 11-1
  Introduction 11-1
  Noise Fundamentals, Standards, and Impact Criteria 11-2
    Noise Fundamentals 11-2
    Noise Standards and Criteria 11-4
  General Noise Assessment 11-4
    Introduction 11-4
    Increased Train Service 11-5
    Relocation of Yard Facilities 11-7
  Detailed Noise Assessment 11-10
    Introduction 11-10
    Noise Prediction Methodology 11-11
    Selection of Noise Receptor Sites 11-11
    Noise Monitoring 11-13
    Rail Noise Prediction Methodology 11-14
    Non-Rail Noise 11-15
  Existing Conditions 11-16
  Probable Impacts of the Project Alternatives 11-16
    No Action Alternative 11-16
    Preferred Alternative 11-17
    TSM Alternative 11-22
  Mitigation 11-22
C. Vibration 11-24
  Introduction and Methodology 11-24
    Vibration Fundamentals 11-24
    Vibration Standards and Criteria 11-25
    Impact Assessment Methodology 11-26
  Existing Vibration Environment 11-27
  Train Force Density and Transfer Mobility 11-28
  Predicted Train-Induced Vibration Levels 11-29
    Track Support Correction .... 11-29Building Coupling Loss Corrections11-29
  Probable Impacts of the Project Alternatives 11-30
    No Action Alternative 11-30
    TSM Alternative 11-30
    Preferred Alternative 11-30

Vibration Mitigation 11-31
Manhattan 11-31
Queens 11-32

12: Energy 12-1
A. Introduction 12-1
B. Existing Conditions 12-1
C. Probable Impacts of the Project Alternatives 12-1
D. Mitigation 12-2

13: Utilities 13-1
A. Introduction 13-1
B. Existing Conditions 13-1
C. Probable Impacts of the Project Alternatives 13-1
No Action Alternative 13-1
Transportation Systems Management (TSM) Alternative 13-1
Preferred Alternative 13-1
Manhattan Alignment 13-2
Queens Alignment 13-3
Yard Locations 13-3
D. Further Investigations and Mitigation 13-4

14: Contaminated Materials 14-1
A. Introduction and Methodology 14-1
Locations of Potential Concern 14-1
Potential Contaminants of Concern 14-2
Methodology 14-3
Regulatory Limits and Regulations/Evaluation Criteria 14-4
Soil 14-5
Groundwater 14-6
B. Existing Conditions 14-6
Manhattan Alignment 14-6
Sunnyside Yard 14-7
Yard A 14-7
Blissville Yard 14-8
Maspeth Yard 14-9
Fresh Pond Yard 14-9
Highbridge Yard 14-10
Roosevelt Island 14-10
C. Future Conditions Common to All Alternatives 14-11
D. Probable Impacts of the Project Alternatives 14-11
No Action Alternative 14-11
TSM Alternative 14-11
Preferred Alternative 14-12
Potential Impacts During Construction 14-12
Potential Impacts During Operation 14-14
E. Mitigation Measures 14-15

15: Natural Resources 15-1
- A. Introduction 15-1
- B. Methodology 15-1
  - Assessment Approach 15-1
  - Regulated Habitats 15-2
    - Wetlands 15-2
    - Water Quality 15-2
    - Ecologically Sensitive Areas 15-3
    - Endangered, Threatened, or Special Concern Species 15-4
    - Floodplain 15-4
    - Navigable Waters 15-5
    - Coastal Zone 15-5
- C. Existing Conditions 15-6
  - Wetlands 15-6
  - Water Quality 15-6
    - East River 15-6
    - Newtown and Maspeth Creeks 15-6
    - Harlem River 15-7
  - Ecologically Sensitive Areas 15-7
    - Sunnyside Yard and Environs 15-7
    - Yard A 15-7
    - Blissville Yard 15-8
    - Maspeth Yard 15-8
    - Fresh Pond Yard 15-8
    - Highbridge Yard 15-9
  - Endangered, Threatened, or Special Concern Species 15-9
  - Floodplain 15-10
  - Navigable Waters 15-10
  - Coastal Zone 15-10
- D. Future Conditions Common to All Alternatives 15-10
- E. Probable Impacts of the Project Alternatives 15-11
  - No Action Alternative 15-11
  - Transportation Systems Management (TSM) Alternative 15-11
  - Preferred Alternative 15-12
    - Wetlands 15-12
    - Water Quality 15-12
    - Floodplain 15-14
    - Coastal Zone 15-14

16: Safety and Security 16-1
- A. Introduction 16-1
- B. Tunnel Safety Measures 16-2
  - Fire Detection and Alarm 16-2
  - Emergency Ventilation for Smoke Control 16-2
  - Emergency Lighting 16-2
  - Emergency Exits 16-2
  - Fire Standpipe and Hose Systems 16-2
  - Emergency Communications 16-2

Blue Light Stations ... 16-3
C. Yard Safety Measures ... 16-3
D. Sunnyside Station Safety Measures ... 16-3
Station Safety ... 16-3
Station Security ... 16-3
Traffic and Pedestrian Access ... 16-4
E. Grand Central Terminal Safety Measures ... 16-5
Mezzanine Safety and Security ... 16-5
Platform Safety and Security ... 16-5
F. At-Grade Crossing Safety Measures ... 16-5

17: Construction and Construction Impacts ... 17-1
A. Introduction ... 17-1
B. Description of Construction Activities ... 17-1
No Action Alternative ... 17-1
TSM Alternative ... 17-1
Platform Lengthening and Track Reconfiguration ... 17-1
Covered Walkway: Long Island City Station to Ferry Terminal ... 17-1
Pedestrian Bridge: Hunterspoint Avenue LIRR Station to Subway Station 17-1
Preferred Alternative ... 17-2
Highbridge Yard Maintenance and Storage Facilities ... 17-2
Manhattan Track Alignment ... 17-2
Grand Central Terminal ... 17-6
Manhattan Ventilation Facilities ... 17-8
Manhattan Substations ... 17-10
Roosevelt Island Substation ... 17-10
Relocation of New York & Atlantic Railway (NYAR) from Yard A in Queens ... 17-10
Queens Track Alignment ... 17-10
Lirr Storage and Maintenance Facilities ... 17-13
Improvements at Harold Interlocking ... 17-13
Sunnyside Station ... 17-14
Queens Substations and Ventilation Facilities ... 17-15
Spoil Disposal for the Preferred Alternative ... 17-15
C. Possible Impacts of the Preferred Alternative During Construction and Associated Mitigation Measures ... 17-17
Land Use and Social Conditions ... 17-18
Existing Land Use and Social Conditions near Project Construction Areas 17-18
Possible Impacts During Construction ... 17-22
Economic Conditions and Relocation ... 17-23
Probable Economic and Fiscal Impacts ... 17-23
Potential Adverse Economic Effects During Construction ... 17-24
Visual and Aesthetic Considerations ... 17-26
Manhattan ... 17-26
Roosevelt Island ... 17-26
Queens Alignment/Sunnyside Yard/Yard A/Harold Interlocking ... 17-26
Yards ... 17-27
Historic Resources ... 17-27

Archaeological Resources 17-28
Transportation 17-28
  Commuter Rail 17-29
  Subways 17-32
  Vehicular Traffic and Parking 17-34
Air Quality 17-38
  Fugitive Emissions 17-39
  Mobile Source Emissions 17-39
  Mitigation 17-40
Noise and Vibration 17-40
  Noise 17-40
  Vibration 17-44
Utilities and Subsurface Structures 17-48
Contaminated Materials 17-48
Natural Resources 17-49
Safety and Security 17-50

18: Environmental Justice 18-1
A. Introduction 18-1
B. Overview of Project Impacts and Affected Population 18-1
  Overview of LITC Population Characteristics 18-2
  No Action Alternative 18-2
  TSM Alternative 18-3
  Preferred Alternative 18-3
    Summary of Unmitigated Impacts 18-3
    Affected Population 18-7
    Conclusions Regarding Environmental Justice 18-10

19: Secondary Effects 19-1
A. Introduction 19-1
B. Secondary Impacts 19-1
  Land Use, Zoning, and Public Policy 19-1
  Social Conditions 19-2
  Economic Conditions and Relocation 19-3
  Transportation 19-5
    Overview 19-5
    Grand Central Terminal and Surrounding Area 19-5
    Long Island City/Sunnyside and Flatbush Avenue Terminal 19-6
    Eastern Queens and Long Island 19-7
  Air Quality 19-8
  Energy 19-8

20: Alternatives Screening and Evaluation 20-1
A. Introduction 20-1
B. Identifying Alternatives 20-1
C. Screening the Long List of Alternatives 20-2
  The No Action and TSM Alternatives (Alternatives 1 and 2) 20-2
  Screening of the Long List Build Alternatives 20-2

Non-Rail Alternative: Bus/HOV Lane (Alternative 3) 20-4
LIRR East Side Terminal Alternatives 20-4
LIRR East Side Station Alternatives 20-5
Sunnyside Transfer Station Alternatives 20-6
Subway Operation over LIRR Tracks 20-7
LIRR Operation over NYCT Tracks 20-8
Conclusion of Long List Alternatives Screening 20-9
C. Evaluating the Refined List of Alternatives 20-9
Evaluation Criteria 20-9
Order-of-Magnitude Capital Cost Range 20-10
Operation and Maintenance (O & M) Costs 20-11
Revenue Impact 20-11
Ridership Impact 20-11
Quality of Service 20-11
Economic Impacts 20-11
Community Impacts 20-12
Environmental Impacts 20-12
Social Equity Impacts 20-12
Evaluating the Alternatives 20-12
TSM (Alternative 2) 20-12
Express Bus/HOV (Alternative 3) 20-14
East Side Terminal (Alternatives 4A-4D) 20-16
Summary of Evaluation 20-18
East River Tunnel with East Side Rail Station (Alternative 6) 20-19
Long Island City Intermodal Transfer Station (Alternative 7D) 20-20
Conclusions of the Refined List Alternatives Evaluation 20-22
D. Evaluation of Other Alternatives 20-22
Apple Corridor 20-22
Use of Upper-Level Metro-North Tracks 20-23
Creating Capacity for LIRR and Airport Access 20-23
Cost Estimates 20-23
E. Selection of a Locally Preferred Alternative 20-23

21: Irreversible and Irretrievable Commitment of Resources 21-1

22: Relationship Between Local Short-Term Uses of the Environment and the Maintenance and Enhancement of Long-Term Productivity . . . 22-1
A. Introduction 22-1
B. Short-Term Uses 22-1
C. Long-Term Productivity 22-1
D. Conclusion 22-2

23: Process and Public Participation 23-1
A. Introduction 23-1
B. Process and Decision-Making to Date 23-1
C. Public Participation Program Elements 23-2
Presentations and Meetings 23-3
Community Board Coordination 23-3

Public Information Meetings 23-4
Small Group Meetings and Presentations 23-4
Technical Advisory Committee (TAC) 23-5
Citizens' Advisory Committee (CAC) 23-5
Presentations Along the Project's Manhattan Alignment 23-5
Agency Coordination 23-6
Rail and Transit Working Committees 23-7
Public Affairs Task Force 23-7
Environmental and Regulatory Agencies 23-7
Informational Materials 23-8
D. Continuation of Public Outreach Program 23-8

24: Selected Sources Consulted and Supporting Documents 24-1
A. Bibliography 24-1
B. List of Supporting Documentation 24-5

25: List of Agencies and Organizations 25-1

26: List of Preparers 26-1

27: Glossary 27-1

Appendices

Ridership Forecasting Results Report
Traffic
Noise and Vibration
Historic and Archaeological Resources

List of Tables

S-1 AM Peak 4-hour Commuter Rail Ridership Without the East Side Access Project: 1995, 2010, 2020 ..... S-2
S-2 Summary of Impacts and Mitigation Measures for the Preferred Alternative ... S-11
1-1 Morning Peak Commuting by LIRR Branch, 1998 East of Jamaica 1-5
1-2 AM Peak 4-Hour Commuter Rail Ridership Without the East Side Access Project: 1995, 2010, 2020 1-8
1-3 AM Peak 4-Hour LIRR Ridership1995, 2010, 2020 1-9
1-4 AM Peak Hour Traffic Conditions 1-11
2-1 Capital Cost Estimates: TSM Alternative 2-6
2-2 Capital Cost Estimates: Preferred Alternative Option 1 and Option 2 2-19
3-1 Zoning Designations in the Long Island City/Sunnyside Study Area 3-17
3-2 Land Area by Land Use Category in Nassau County, 1998 3-18
3-3 Known Development Projects in Manhattan Study Area, 1995-2010 3-24
3-4 Known Development Projects in Manhattan Study Area, 2010-2020 3-25
4-1 LITC 1995 Labor Force by Employment Location 4-3
4-2 Manhattan Study Area Population Characteristics, 1990 and 1995 4-5
4-3 Long Island City/Sunnyside Study Area Community Facilities 4-7
4-4 Long Island City/Sunnyside Study Area 1990 Population Characteristics 4-8
4-5 Long Island Population Trends (In Thousands) 4-10
4-6 Long Island 1990 Population Characteristics 4-10
4-7 Total Labor Force Trends (In Thousands) 4-11
4-8 Yard Study Areas Community Facilities 4-12
4-9 Yard Study Areas—1990 Population Characteristics 4-13
4-10 LITC Population 1995, 2010, 2020 (In Thousands) 4-16
4-11 LITC Employed Labor Force 1995, 2010, 2020 (In Thousands) 4-16
4-12 LITC 2010 Labor Force by Employment Location 4-17
4-13 LITC 2020 Labor Force by Employment Location 4-17
4-14 Manhattan Population Trends: 1995, 2010, and 2020 4-19
5-1 LITC Employment: 1995 5-5
5-2 Recent Selected Private Sector Employment Trends: LITC 5-6
5-3 Recent Selected Private Sector Employment Trends: Manhattan 5-7
5-4 Manhattan Study Area Employment: 1995 5-8
5-5 1999 Manhattan Office Market Statistics 5-10
5-6 Recent Selected Private Sector Employment Trends: Lng Island City/Sunnyside 5-12
5-7 Recent Selected Private Sector Employment Trends: Nssau and Suffolk Counties5-14
5-8 Long Island Office Market Trends 5-14
5-9 Long Island Year-End 1998 Office Market and Submarket Statistics 5-15
5-10 LITC Employment Trends: 1995 to 2020 5-17
5-11 Manhattan Employment Trends: 1995 to 2020 5-18
5-12 Potential Property Acquisitions Required and Potentially Displaced Businesses 5-25

7-1 Known Historic Resources Within the Manhattan Alignment Ape 7-9
7-2 Determination of Eligibility for Potential Historic Resources Identified Within the Manhattan Alignment Ape . 7-13
7-3 Determination of Eligibility for Potential Historic Resources Identified Within the Queens Alignment Ape . 7-15
9B-1 LIRR AM Peak Hour Train Arrivals: No Action and Preferred Alternatives ... 9B-4
9B-2 LIRR Weekday AM Peak Period Arrivals at New York City Terminals: 2010, 2020 ...... 9B-4
9B-3 Ridership by Branch: Weekday AM Peak Period Boardings, 2010, 2020 ..... 9B-5
9B-4 Change in Vehicle Miles Traveled: 2010, 2020 No Action vs. Preferred 9B-6
9B-5 AM Peak Period Ridership: Queens to Manhattan Subways, 2010, 2020 ..... 9B-7
9B-6 LIRR Passengers Transferring to Subways in the Vicinity of Penn Station: AM Peak Period, 2010, 2020 .... 9B-8
9B-7 LIRR Passengers Transferring to Subways at Grand Central Terminal: 6-10 AM Peak Period, 2010, 2020 .... 9B-9
9C-1 Existing Traffic Level of Service Summaries: Grand Central Terminal Study Area 9C-4
9C-2 Existing AM Peak Period Analysis of Pedestrian Circulation Elements Within Grand Central Terminal 9C-11
9C-3 Existing Pm Peak Period Analysis of Pedestrian Circulation Elements Within Grand Central Terminal 9C-12
9C-4 Existing Am and Pm Peak Period Volume-to-Capacity Ratios of Key GCT Exit Elements 9C-13
9C-5 Existing Pedestrian Time-space Analyses Lexington Avenue Subway (IRT 4, 5, 6) Platforms at Grand Central Terminal 9C-15
9C-6 Existing Subway Stair Analyses Lexington Avenue Subway (IRT 4, 5, 6) Platforms at Grand Central Terminal 9C-17
9C-7 Existing Pedestrian Time-Space Analyses IRT Fare Collection Area #238 at 42nd Street Station 9C-18
9C-8 Existing Lexington Avenue Subway Line-Haul Conditions at 42nd Street Grand Central Station Downtown (AM Peak) 9C-19
9C-9 Existing Corner Reservoir Pedestrian Levels of Service: Grand Central Terminal Study Area 9C-21
9C-10 Existing Crosswalk Pedestrian Levels of Service: GCT Study Area 9C-22
9C-11 Existing Mid-Block Pedestrian Levels of Service: GCT Study Area 9C-23
9C-12 Existing Bus Ridership Levels: GCT Area 9C-25
9C-12a Metro-North Arrivals/Departures from GCT: 1995, 2010, 2020 .... 9C-26
9C-13 Traffic Level of Service Summary Comparison: Existing Vs. Future No Action Conditions 9C-27
9C-14 Existing Traffic Level of Service Summaries: GCT Study Area 9C-29
9C-15 2010 No Action AM Peak Period Analysis of Pedestrian Circulation Elements Within Grand Central Terminal 9C-31
9C-16 2010 No Action PM Peak Period Analysis of Pedestrian Circulation Elements Within Grand Central Terminal 9C-32
9C-17 2020 No Action AM Peak Period Analysis of Pedestrian Circulation Elements Within Grand Central Terminal 9C-33
9C-18 2020 No Action PM Peak Period Analysis of Pedestrian Circulation Elements Within Grand Central Terminal 9C-34

9C-19 2010 No Action AM and PM Peak Period Volume-to-Capacity Ratios of Key GCT Exit Elements 9C-35
9C-20 2020 No Action Am and Pm Peak Period Volume-to-Capacity Ratios of Key GCT Exit Elements 9C-36
9C-21 2010 No Action Subway Stair Analyses Lexington Avenue Subway (IRT 4, 5, 6) Platforms at Grand Central Terminal 9C-37
9C-22 2020 No Action Subway Stair Analyses Lexington Avenue Subway (IRT 4, 5, 6) Platforms at Grand Central Terminal 9C-38
9C-23 2010 No Action Pedestrian Time-space Analyses Lexington Avenue Subway (IRT 4, 5, 6) Platforms at Grand Central Terminal 9C-40
9C-24 2020 No Action Pedestrian Time-Space Analyses Lexington Avenue Subway (IRT 4, 5, 6) Platforms at Grand Central Terminal 9C-41
9C-25 2010 No Action Pedestrian Time-space Analyses IRT Fare Collection Area #238 at 42nd Street Station 9C-42
9C-27 Lexington Avenue Subway Line-Haul Conditions at 42nd Street Grand Central Station (No Action Alternative Year 2010) Downtown (AM Peak) 9C-43
9C-28 2010 No Action Corner Reservoir Pedestrian Levels of Service: Grand Central Terminal Study Area 9C-44
9C-29 2010 No Action Crosswalk Pedestrian Levels of Service: GCT Study Area .. 9C-45
9C-30 2010 No Action Mid-block Pedestrian Levels of Service: GCT Study Area .. 9C-46
9C-31 No Action Alternative Bus Ridership Levels: GCT Area 9C-46
9C-32 Traffic Level of Service Summary Comparison: Preferred Alternative Vs. No Action Alternative Conditions 9C-48
9C-33 Preferred Alternative Traffic Level of Service Summaries: Grand Central Terminal Study Area 9C-49
9C-34 Distribution of Am Peak LIRR Passengers Arriving at Gct in 2020 .... 9C-54
9C-35 2010 Preferred Alternative Am Peak Period Analysis of Pedestrian Circulation Elements, Critical Elements Within Grand Central Terminal 9C-58
9C-36 2010 Preferred Alternative Pm Peak Period Analysis of Pedestrian Circulation Elements, Critical Elements Within Grand Central Terminal 9C-59
9C-37 2020 Preferred Alternative Am Peak Period Analysis of Pedestrian Circulation Elements, Critical Elements Within Grand Central Terminal 9C-60
9C-38 2020 Build Pm Peak Period Analysis of Pedestrian Circulation Elements, Critical Elements Within Grand Central Terminal 9C-61
9C-39 2010 Preferred Alternative AM and PM Peak Period Volume-to-Capacity Ratios of Key GCT Exit Elements ... 9C-62
9C-40 2020 Preferred Alternative AM and PM Peak Period Volume-to-Capacity Ratios of Key GCT Exit Elements ... 9C-63
9C-41 Preferred Alternative AM Peak Period Analyses of Vertical Circulation Elements, LIRR Platforms 1-5 at Grand Central Terminal 9C-66
9C-42 Preferred Alternative Pedestrian Time-Space Analyses for LIRR Platforms 1-5 at Grand Central Terminal 9C-67
9C-43 Preferred Alternative PM Peak Hour Pedestrian Time-Space Analyses Crosspassageways at GCT 9C-68
9C-44 2010 Preferred Alternative Pedestrian Time-Space Analyses IRT Fare Collection Area #238 at 42nd Street Station 9C-71

9C-45 2020 Preferred Alternative Pedestrian Time-space Analyses IRT Fare Collection Area #238 at 42nd Street Station 9C-71
9C-46 2010 Preferred Alternative Subway Stair Analyses Lexington Avenue Subway (IRT 4, 5, 6) Platforms at Grand Central Terminal 9C-72
9C-47 2020 Preferred Alternative Subway Stair Analyses Lexington Avenue Subway (IRT 4, 5, 6) Platforms at Grand Central Terminal 9C-73
9C-48 2010 Preferred Alternative Pedestrian Time-Space Analyses Lexington Avenue Subway (IRT 4, 5, 6) Platforms at Grand Central Terminal 9C-74
9C-49 2020 Preferred Alternative Pedestrian Time-space Analyses Lexington Avenue Subway (IRT 4, 5, 6) Platforms at Grand Central Terminal 9C-75
9C-50 2010 Mitigated Preferred Alternative AM and PM Peak Period Analysis of Pedestrian Circulation Elements Within Grand Central Terminal 9C-78
9C-51 2020 Mitigated Preferred Alternative AM and PM Peak Period Analysis of Pedestrian Circulation Elements Within Grand Central Terminal 9C-79
9C-52 2010 Mitigated Preferred Alternative Pedestrian Time-Space Analyses IRT Fare Collection Area #238 at 42nd Street Station 9C-80
9C-53 2020 Mitigated Preferred Alternative Pedestrian Time-Space Analyses IRT Fare Collection Area #238 at 42nd Street Station 9C-80
9C-54 2010 Mitigated Preferred Alternative Subway Stair Analyses Lexington Avenue Subway (IRT 4, 5, 6) Platforms at Grand Central Terminal 9C-81
9C-55 2020 Mitigated Preferred Alternative Subway Stair Analyses Lexington Avenue Subway (IRT 4, 5, 6) Platforms at Grand Central Terminal 9C-82
9C-56 2010 Mitigated Preferred Alternative Pedestrian Time-Space Analyses Lexington Avenue Subway (IRT 4, 5, 6) Platforms at Grand Central Terminal 9C-83
9C-57 2020 Mitigated Preferred Alternative Pedestrian Time-Space Analyses Lexington Avenue Subway (IRT 4, 5, 6) Platforms at Grand Central Terminal 9C-84
9C-58 Lexington Avenue Subway Line-Haul Conditions at 42nd Street Grand Central Station (Preferred Alternative Year 2010): Second Avenue Subway: Downtown (AM Peak) 9C-85
9C-59 2010 Preferred Alternative Corner Reservoir Pedestrian Levels of Service: GCT Study Area 9C-89
9C-60 2010 Preferred Alternative Crosswalk Pedestrian Levels of Service: GCT Study Area 9C-90
9C-61 2010 Preferred Alternative Mid-Block Pedestrian Levels of Service: GCT Study Area 9C-91
9C-62 Mitigated Preferred Alternative Corner Reservoir Pedestrian Levels of Service: GCT Study Area 9C-93
9C-63 Mitigated Preferred Alternative Crosswalk Pedestrian Levels of Service: GCT Study Area 9C-93
9D-1 Existing Traffic Level of Service Summaries: Sunnyside Study Area 9D-2
9D-2 No Action Traffic Level of Service Summaries: Sunnyside Study Area 9D-5
9E-1 Existing Traffic Level of Service Summaries: Long Island Rail Road Station Areas 9E-6
9E-2 LIRR Grade Crossings: Existing Delays, Auto Peak Hour 9E-7
9E-3 LIRR Grade Crossings: Existing Delays, Train Peak Hour 9E-8
9E-4 Existing Parking Capacity and Utilization at LIRR Stations 9E-10
9E-5 Traffic Level of Service Summary Comparison: Existing vs. Future No Action Alternative 9E-13

9E-6 No Action Traffic Level of Service Summaries Long Island Rail Road Station Areas 9E-15
9E-7 LIRR Grade Crossing Impacts: No Action Alternative vs. Existing Conditions 9E-17
9E-8 No Action Parking Capacity and Utilization at LIRR Stations 9E-19
9E-9 Vehicle Trips Generated at LIRR Stations by the East Side Access Project (AM Peak Hour) 9E-22
9E-10 Traffic Level of Service Summary Comparison: Preferred vs. No Action Alternative 9E-22
9E-11 Preferred Alternative Traffic Level of Service and Significant Impact Summaries: Long Island Rail Road Station Areas 9E-24
9E-12 LIRR Grade Crossing Impacts: Preferred Alternative vs. No Action Alternative 9E-27
9E-13 East Side Access (Preferred) Alternative Parking Capacity and Utilization at LIRR Stations 9E-30
9E-14 Vehicle Trips Generated at LIRR Stations under the TSM Alternative (AM Peak Hour) 9E-36
9E-15 Parking Demand Generated at LIRR Stations under the TSM Alternative vs. The Preferred Alternative 9E-37
10-1 National and New York State Ambient Air Quality Standards 10-4
10-2 Counties Designated Non-Attainment by Epa in New York City and Long Island 10-5
10-3 Mobile Source Receptor Locations, GCT Area 10-9
10-4 Mobile Source Receptor Screening Locations, Long Island and Queens 10-10
10-5 Representative Monitored Ambient Air Quality Data, New York City 10-11
10-6 Representative Monitored Ambient Air Quality Data, Long Island 10-12
10-7 Maximum Predicted 8-Hour Average Carbon Monoxide Concentrations in 2010 10-13
10-8 Regional Mobile Source Pollutant Burdens Relative to the No Action Alternative 10-14
10-9 Maximum Predicted 8-Hour Average Carbon Monoxide Concentrations in 2010 for Proposed Traffic Mitigation Measures 10-16
11-1 Common Noise Levels 11-3
11-2 FTA's Land Use Category and Metrics for Transit Noise Impact Criteria 11-5
11-3 LIRR Branch Segment Representation 11-6
11-4 General Noise Assessment Results by Location, Peak Hour (8 to 9 AM), 50 Feet from Track Centerline 11-8
11-5 General Noise Assessment Results by Location, Day-Night (7 AM to 10 PM, 10 PM to 7 AM), 50 Feet from Track Centerline . 11-9
11-6 General Noise Assessment (Yards) 11-10
11-7 Noise Receptor Sites and Locations 11-12
11-8 Input Train Data for Detailed Noise Analysis 11-16
11-9 Existing Noise Levels 11-17
11-10 Impact Evaluation of Noise from the No Action Alternative 11-18
11-11 Impact Evaluation of Noise from the Preferred Alternative 11-19
11-12 Typical Levels of Ground-Borne Vibration 11-25
11-13 Ground-Borne Vibration and Noise Impact Criteria 11-27
11-14 Ambient Vibration Levels 11-28
11-15 On-Site Vibration Propagation Test Locations 11-29
11-16 Building Coupling Loss Categories 11-30

12-1 Net Energy Consumption for Project Alternatives vs. No Action Alternative ... 12-2
14-1 Project Evaluation Criteria ... 14-5
15-1 New York State Department of Environmental Conservation Surface Water Quality Classifications ... 15-3
17-1 Typical Noise Emission Levels for Construction Equipment ... 17-42
17-2 Typical Vibration Source Levels ... 17-44
18-1 Study Area 1990 Population Characteristics ... 18-2
18-2 Summary of Impacts and Mitigation Measures for the Preferred Alternative ... 18-4
18-3 Population Affected by the Preferred Alternative, Noise Impacts ... 18-9
20-1 Screening of Long List Alternatives ... 20-3
20-2 Evaluation Criteria ... 20-10
20-3 Refined Long List Alternatives Evaluation Summary ... 20-13
23-1 Community Board Presentations ... 23-3
23-2 Public Information Meetings ... 23-4
23-3 Small Group Meetings and Presentations ... 23-4
23-4 Technical Advisory Committee Meetings ... 23-5
23-5 Citizens' Advisory Committee Meetings ... 23-6
23-6 Targeted Outreach ... 23-6

List of Figures

Following Page

S-1 Context Map S-1
S-2 Project Elements in Manhattan and Queens S-1
S-3 Manhattan Alignment: Option 1 . . . . . S-6
S-4 Manhattan Alignment: Option 2 . . . . . S-6
S-5 Queens Tunnels—Overall Plan S-8
1-1 Project Location 1-2
1-2 Location of Preferred Alternative 1-2
1-3 Regional Transportation Network 1-2
1-4 Long Island Rail Road Map 1-4
2-1 TSM Alternative: Long Island City Elements 2-4
2-2 TSM Alternative: Extension of Contra-Flow Lane 2-6
2-3 Project Elements in Manhattan and Queens 2-8
2-4 Context Map 2-8
2-5 Existing Floor Plans: Grand Central Terminal 2-8
2-6 GCT Lower Level Platform Layout—Option 1 2-10
2-7 New Escalators into Biltmore Room—Option 1 2-10
2-8 Mezzanine Elements in GCT: Option 1 2-10
2-9 Proposed Street Entrances: Options 1 and 2 2-10
2-10 Proposed Mezzanine at Lower Level: Option 2 2-10
2-11 Longitudinal Section, Looking West: Option 2 2-10
2-12 Cross Section though 44th Street, Looking South: Option 2 2-10
2-13 Manhattan Alignment: Option 1 2-12
2-14 Manhattan Alignment: Option 2 2-12
2-15 Manhattan Alignment Profile Looking West: Options 1 and 2 2-12
2-16 Project Elements in Sunnyside, Queens 2-12
2-17 Queens Tunnels—Overall Plan 2-14
2-18 Project Elements in Yard A 2-14
2-19 Sunnyside Station Site Plan 2-14
2-20 New Blissville Yard Facilities 2-18
2-21 New Maspeth Yard Facilities 2-18
2-22 New Fresh Pond Yard Facility 2-18
3-1 Manhattan Land Use Study Area 3-2
3-2 Land Use: Manhattan Study Area 3-6
3-3 Land Use: Long Island City/Sunnyside 3-16
3-4 Zoning: Long Island City/Sunnyside Study Area 3-16
3-5 Land Use: Blissville Yard 3-22
3-6 Zoning: Blissville Yard 3-22
3-7 Land Use: Maspeth Yard 3-22
3-8 Zoning: Maspeth Yard 3-22

3-9 Land Use: Fresh Pond Yard 3-22
3-10 Zoning: Fresh Pond Yard 3-24
3-11 Land Use: Highbridge Yard 3-24
3-12 Zoning: Highbridge Yard 3-24
4-1 Social Conditions: Long Island City/Sunnyside Study Area 4-6
4-2 Social Conditions: Maspeth Yard Study Area 4-12
4-3 Social Conditions: Fresh Pond Yard Study Area 4-14
4-4 Social Conditions: Highbridge Yard Study Area 4-14
5-1 1998 Major Private Employment Categories 5-4
5-2 Manhattan Areas of Potential Displacement 5-24
5-3 Queens Areas of Potential Displacement 5-28
6-1 Manhattan Alignment—Key to Photographs 6-22
6-2 Manhattan Alignment—Views of the Affected Areas 6-22
6-3 Manhattan Alignment—Views of the Affected Areas 6-22
6-4 Manhattan Alignment—Views of the Affected Areas 6-22
6-5 Manhattan Alignment—Views of the Affected Areas 6-22
6-6 Queens Alignment—Key to Photographs 6-22
6-7 Queens Alignment, the Yards—Views of the Affected Areas 6-22
6-8 Queens Alignment, the Yards—Views of the Affected Areas 6-22
6-9 Queens Alignment, the Yards—Views of the Affected Areas 6-22
6-10 Queens Alignment, the Yards—Visual Context 6-22
6-11 Queens Alignment, the Yards—Visual Context 6-22
6-12 Other Areas Associated with the Queens Alignment—Views of the Affected Areas 6-22
6-13 Other Areas Associated with the Queens Alignment—Views of the Affected Areas and Visual Context 6-22
6-14 Other Areas Associated with the Queens Alignment—Visual Context 6-22
6-15 Blissville Yard—Key to Photographs 6-22
6-16 Blissville Yard—Views of the Study Area 6-22
6-17 Blissville Yard—Views of the Study Area 6-22
6-18 Blissville Yard—Views of the Affected Areas 6-22
6-19 Maspeth Yard—Key to Photographs 6-22
6-20 Maspeth Yard—Views of the Study Area 6-22
6-21 Maspeth Yard—Views of the Study Area 6-22
6-22 Fresh Pond Yard—Key to Photographs 6-22
6-23 Fresh Pond Yard—Views of the Study Area 6-22
6-24 Fresh Pond Yard—Views of the Study Area 6-22
6-25 Fresh Pond Yard—Views of the Study Area 6-22
6-26 Highbridge Yard—Key to Photographs 6-22
6-27 Highbridge Yard—Views of the Study Area 6-22
6-28 Highbridge Yard—Views of the Study Area 6-22
7-1 Manhattan Alignment and Area of Potential Effect—Historic Resources 7-2
7-2 Queens Alignment and Area of Potential Effect—Historic Resources 7-2
7-3 Blissville Yard and Area of Potential Effect—Historic Resources 7-2
7-4 Maspeth Yard and Area of Potential Effect—Historic Resources 7-2
7-5 Fresh Pond Yard and Area of Potential Effect—Historic Resources 7-2
7-6 Highbridge Yard and Area of Potential Effect—Historic Resources 7-2
7-7 Manhattan Alignment—Known Historic Resources 7-8

7-8 Manhattan Alignment—State/National Register Eligible and Potential Historic Resources 7-12
7-9 Manhattan Alignment APE - Potential Historic Resources 7-12
7-10 Manhattan Alignment APE - Potential Historic Resources 7-12
7-11 Manhattan Alignment APE - Potential Historic Resources 7-12
7-12 Manhattan Alignment APE - Potential Historic Resources 7-12
7-13 Queens Alignment—Known Historic Resources 7-16
7-14 Queens Alignment—State/National Register Eligible 7-16
and Potential Historic Resources Potential Historic Resources 7-16
7-15 Queens Alignment APE - Potential Historic Resources 7-16
7-16 Highbridge Yard—Known Historic Resources 7-16
8-1 Manhattan Alignment Options 1 and 2 Areas of Potential Effect— Archaeological Resources 8-4
8-2 Queens Alignment and Area of Potential Effect—Archaeological Resources ... 8-4
8-3 Roosevelt Island Area of Potential Effect—Archaeological Resources 8-4
8-4 Blissville Yard and Area of Potential Effect—Archaeological Resources 8-4
8-5 Maspeth Yard and Area of Potential Effect—Archaeological Resources 8-4
8-6 Fresh Pond Yard and Area of Potential Effect—Archaeological Resources 8-4
8-7 Highbridge Yard and Area of Potential Effect—Archaeological Resources 8-4
8-8 Queens Alignment—Potential Archaeologically Sensitive Areas 8-10
9C-1 Traffic Study Area in Manhattan 9C-2
9C-2 Pedestrian Analysis Locations: Grand Central Terminal 9C-8
9C-3 Stairwell Analysis Locations: Lexington Avenue Subway Mezzanine at Grand Central Terminal 9C-14
9C-4 Pedestrian Study Area in Manhattan 9C-20
11-1 FTA's Noise Impact Criteria for Transit Projects 11-4
11-2 General Noise Assessment Results 11-10
11-3 Noise Monitoring Receptor Sites 11-12
11-4 Ambient Vibration Monitoring Sites in Manhattan 11-28
11-5 Potential Train-Induced Ground-Borne Noise Impacts Manhattan Alignment: Option 1 11-32
11-6 Potential Train-Induced Ground-Borne Noise Impacts Queens Alignment: ... 11-32
14-1 Sampling Locations at Yard A/Sunnyside Yard 14-8
14-2 ESA and NYCT Cut-Off Walls 14-14
15-1 Floodplain: Sunnyside Yard and Yard A 15-10
15-2 Floodplain: Blissville Yard 15-10
15-3 Floodplain: Highbridge Yard 15-10
17-1 Option 1: Underpinning of Racquet and Tennis Club (Cross-Section Looking North) 17-5
17-2 Queens Construction Techniques 17-11
18-1 Block Groups with Minority Concentrations: Long Island Transportation Corridor, 1990 18-2
18-1 Block Groups with Concentrations of Poverty: Long Island Transportation Corridor, 1990 18-10

⁂

A. INTRODUCTION

The Federal Transit Administration (FTA) and the Metropolitan Transportation Authority (MTA), in cooperation with the Long Island Rail Road (LIRR), propose the East Side Access Project, to provide direct access for LIRR riders to Grand Central Terminal (GCT). The proposed project is the locally preferred alternative, recommended after careful consideration of a full range of alternatives in the Major Investment Study (MIS) for the Long Island Transportation Corridor (LITC), which was completed in April 1998. The LITC is broadly defined to encompass the majority of origins, destinations, and routes of those traveling between Long Island and New York City, and therefore consists of Manhattan, Queens and Brooklyn, and Nassau and Suffolk Counties.

As shown in Figures S-1 and S-2, the East Side Access Project would bring passengers to GCT by constructing connections from the LIRR Main Line and Port Washington tracks south of Sunnyside Yard (in Queens) through the lower level of the existing 63rd Street Tunnel under the East River and from there to GCT. The new connecting tunnel in Queens would pass beneath Long Island City at approximately 41st Avenue; in Manhattan, the connecting tunnel would curve southward from the existing tunnel at 63rd Street and approximately Second Avenue toward Park Avenue, where it would continue to GCT.

The East Side Access Project would also create a new station to serve customers at Sunnyside and Long Island City, Queens. This station, adjacent to Sunnyside Yard at Queens Boulevard, would offer LIRR service to Penn Station. The station would be constructed to permit future expansion for possible use by Amtrak and/or New Jersey Transit (NJ Transit) trains.

B. PURPOSE AND NEED FOR THE PROJECT

The need for improved transit service between Long Island and Manhattan—especially East Midtown Manhattan—is clear. Currently, people who live on Long Island and work in Manhattan are faced with choosing among increasingly congested modes of transportation. The LIRR, the MTA New York City Transit (NYCT) bus and subway system, and the regional highway network are all operating at or near capacity at the busiest times of day. The congestion leads to increased commuting times and greater difficulties in getting to work. These difficulties, in turn, compromise the growth of both New York City's job base and Long Island's residential base.

The cause of these transportation problems lies in the economic and residential development of the region. Although total employment in Manhattan has stayed essentially the same since the early 1970's, white-collar jobs have risen dramatically and consistently, while blue-collar jobs in industries such as manufacturing have declined. As a result, Manhattan has experienced a tremendous growth in new office space in the post World War II period (nearly 213 million square feet), and East Midtown has seen most (62 percent) of that growth (nearly 132 million square feet). Along with this shift in employment type and location has come a concurrent shift in the residential location of the labor force. In particular, an increasing number of Manhattan workers are living in Nassau and Suffolk County suburbs and commuting to jobs in Manhattan.

Population, employment, and labor force projections prepared by New York Metropolitan Transportation Council (NYMTC) for New York City and Long Island for the years 2010 and 2020 indicate that these trends will continue. Employment in Manhattan is projected to increase 21 percent by 2020, and the size of the labor force in Nassau, Suffolk, and Queens is projected to increase 28 percent by 2020.* These trends indicate that demands on the currently overtaxed transit and traffic systems will increase significantly, as the number of morning commuters arriving during the peak 4-hour period is projected to increase by 28 percent at both Penn Station and at GCT in the period between 1995 and 2020 (see Table S-1).

Table S-1

AM Peak 4-Hour Commuter Rail Ridership Without the East Side Access Project: 1995, 2010, 2020

Terminal	1995 Arrivals	2010 Arrivals	Percent Change 1995-2010	2020 Arrivals	Percent Change 1995-2020
LIRR to Penn Station	86,630	103,856	20%	110,522	28%
MNR to GCT	70,169	84,164	20%	88,738	27%

Source: KPMG Peat Marwick, LLP.

CAPACITY PROBLEMS AND NEEDS

These historical shifts in residential and office locations in the region, combined with projected growth in employment and labor force, have consequences for the capacity of the transportation system. The commuter rail transit capacity problem is most noticeable at Penn Station, the LIRR's only station in Manhattan. Penn Station is now operating at close to maximum capacity. The capacity of the East River Tunnels, the capacity of platforms and storage tracks at Penn Station, and the system's track layout all prevent the LIRR from increasing service into Penn Station by a large amount. Trains that enter Penn Station currently are overcrowded, and in the future, the situation will worsen. By 2020, at the busiest time of day, LIRR trains into Penn Station are projected to be operating at 127 percent of capacity.

The subway system, too, is operating at capacity during peak periods of the day. Some trains from Queens into Manhattan, including the Queens Boulevard lines (E, F, and R) are extremely crowded during rush hours. Automobile users also face congestion. Major highways like the Long Island Expressway (LIE) and the Grand Central/Northern State Parkway operate at capacity during peak periods of the day, as do major river crossings such as the Triborough and Queensboro Bridges and the Queens-Midtown Tunnel. With the LIRR, subways, and highways operating at or near capacity, delays on all modes of transportation are a common occurrence in the LITC.

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* Projections prepared by Urbanomics for NYMTC, February 23, 1996.

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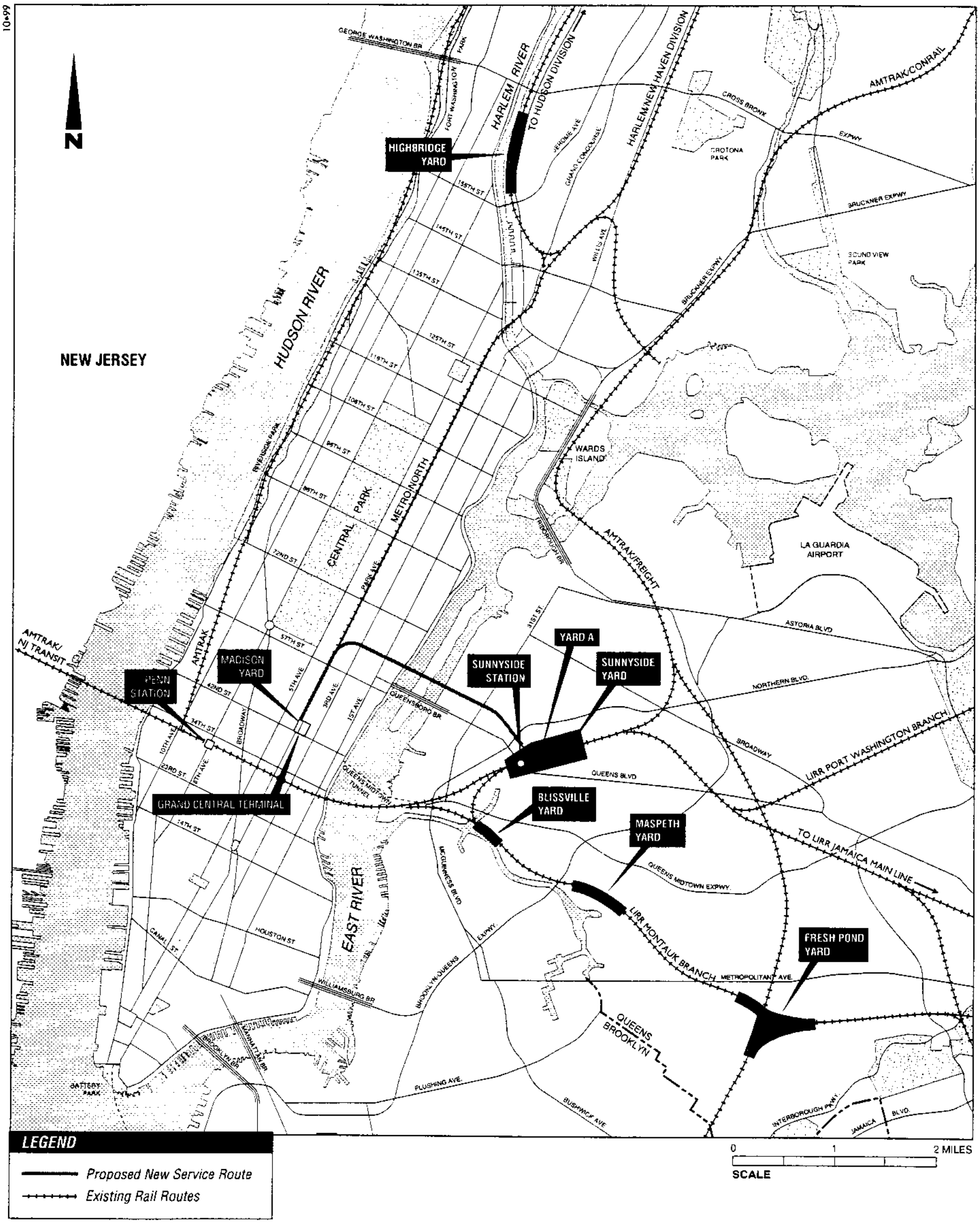

Figure S-1

Context Map

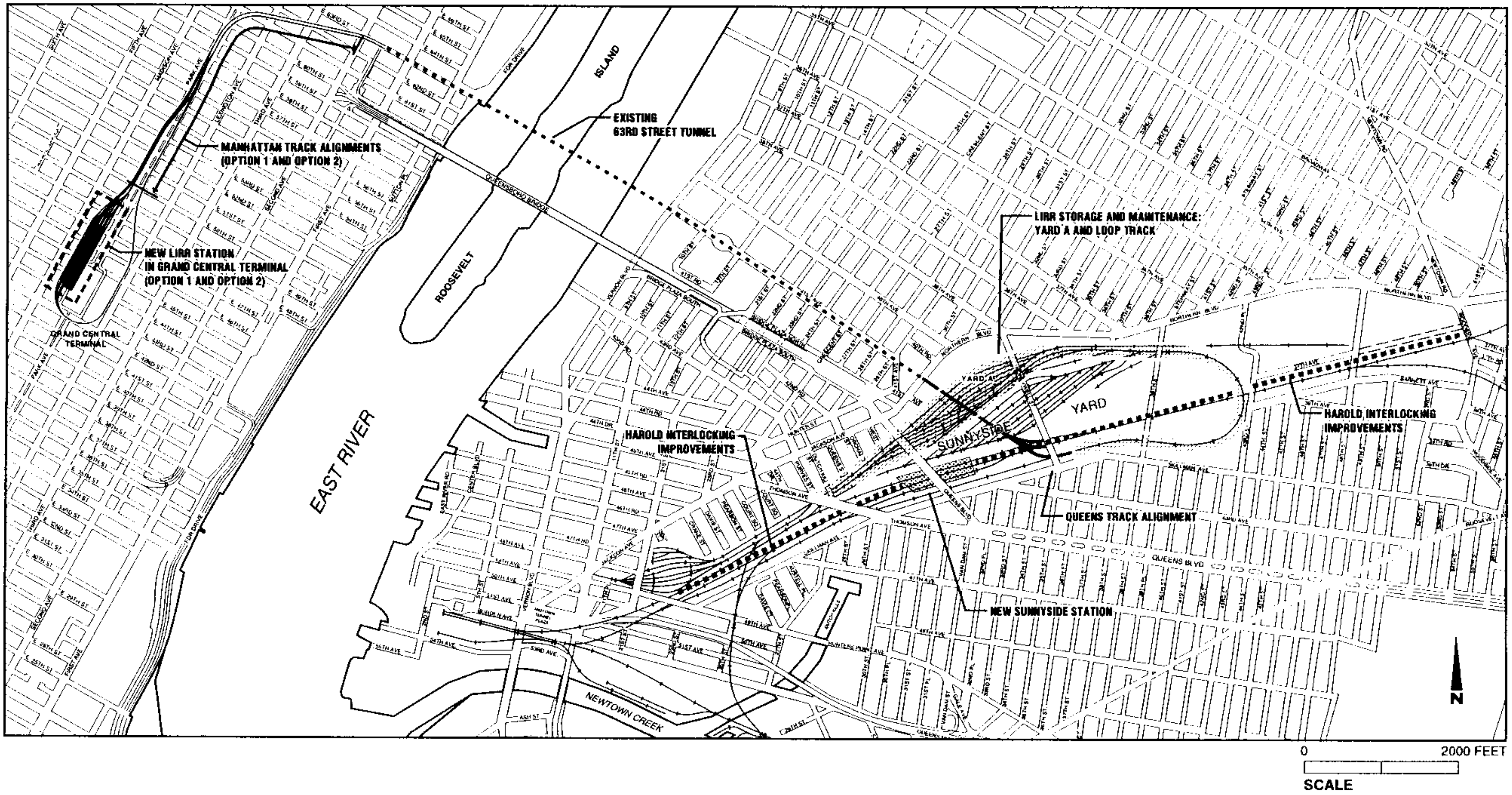
EXISTING 63RD STREET TUNNEL
MANHATTAN TRACK ALIGNMENTS (OPTION 1 AND OPTION 2)
NEW LIRR STATION IN GRAND CENTRAL TERMINAL (OPTION 1 AND OPTION 2)
GRAND CENTRAL TERMINAL
ROOSEVELT
ISLAND
EAST RIVER
QUEENSBORO BRIDGE
LIRR STORAGE AND MAINTENANCE: YARD A AND LOOP TRACK
YARD 'A'
SUNNYSIDE
YARD
HAROLD INTERLOCKING IMPROVEMENTS
HAROLD INTERLOCKING IMPROVEMENTS
QUEENS TRACK ALIGNMENT
NEW SUNNYSIDE STATION
QUEENS BLVD
NEWTOWN CREEK
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Figure S-2

Project Elements in Manhattan and Queens

TRAVEL TIME PROBLEMS AND NEEDS

In some cases, excessive travel times in the corridor are a direct consequence of capacity constraints, but in the case of access to East Midtown, lengthened travel times are also an issue of "disconnection." While LIRR trains enter Manhattan on the East Side through the East River Tunnels at 33rd Street, passengers cannot disembark until trains reach the West Side. Commuters who work in East Midtown, or at any location on the East Side, must double-back across town to reach their destinations. It is estimated that doubling-back costs commuters anywhere from 15 to 30 minutes of commuting time each way (for up to 1 hour each day). Since the train ride is typically 30 minutes to an hour, this in-Manhattan trip adds substantial time to the total trip. To avoid this doubling-back, some LIRR commuters transfer to subway connections in Queens to travel to destinations on the East Side or in Lower Manhattan. The additional LIRR travel time to East Midtown and the inconvenience of the transfer encourages some commuters to drive to work, adding to highway, local road, and bridge and tunnel congestion.

The congestion and inconvenience associated with the area's transit system—its increasing lack of capacity, its inaccessibility to many residents, its unreliability and slow speeds, and its inability to cope with change and growth—threatens the vitality of the regional economy and contributes to a decline in community character and quality of life throughout the corridor.

PROJECT NEED

The proposed action is critical for the future of the LITC. Without the project, transportation conditions in the corridor will deteriorate:

- The LIRR will not be able to accommodate demand for service into Manhattan, causing severe overcrowding on peak hour trains.
- Commutes on the LIRR characterized by crowding and delays will continue to be followed by time-consuming trips to East Midtown by many LIRR commuters, causing millions of person-hours of delay each year.
- Inadequate transit service will worsen already serious congestion on the region's roads and highways, as residents of Long Island and eastern Queens choose to drive to avoid the growing inconvenience of mass transit.
- Commuters in aggregate will travel hundreds of thousands of miles in automobiles, worsening already poor air quality conditions.

CURRENT PLANNING CONTEXT

Problems similar to those encountered in the LITC can be found in varying degrees throughout MTA's vast transportation system. Recognizing the need for system-wide improvement and the interconnections among the system's many components, MTA has developed the "Long Range Planning Framework" aimed at a unified program of improvements to its subway and commuter rail systems. MTA is examining how its network can be expanded and adapted to meet long-term access and mobility needs via seven coordinated but independent studies. The following MTA projects and studies are intended to alleviate overcrowding, reduce travel time, better connect the rail and subway lines, provide high-quality service, and extend service to underserved areas:

- East River Crossing Study, which assesses alternative strategies to improve transit service between Brooklyn and Manhattan;
- The Manhattan East Side Transit Alternatives Project (MESA), which examines NYCT's long-term needs and options for increasing transit capacity on Manhattan's East Side;
- Access to the Region's Core (ARC), which examines long-term transportation initiatives to improve access and mobility from west of the Hudson and Queens/Long Island to Midtown Manhattan's CBD ("the core");
- Lower Manhattan Access, which identifies, evaluates, and recommends alternatives for short- and long-term access improvements to Lower Manhattan for New York's suburban commuters using Metro-North Railroad (MNR) or the LIRR;
- Metro-North Penn Station Access, which considers options for bringing Metro-North Railroad commuter trains into Penn Station via tracks currently used by Amtrak trains for long-distance travel; and
- La Guardia Subway Access Study, which is evaluating methods to create one-seat rail rapid transit access from Lower and Midtown Manhattan to La Guardia Airport, perhaps via an extension of the Broadway line N train.

These five studies, along with MTA/LIRR East Side Access, are being coordinated through the MTA Long Range Planning Framework Group, which consists of study managers and key staff from MTA and its subsidiaries: LIRR, Metro-North, and NYCT, as well as the New York Metropolitan Transportation Council (NYMTC), the Port Authority of New York and New Jersey, and NJ Transit.

C. PROJECT ALTERNATIVES

Development and evaluation of alternatives for the East Side Access Project began in the MIS phase of the project. The alternatives screening and evaluation phase considered all options suggested, evaluating each against the projects's goals and objectives. Alternatives were first grouped into a "long list of project alternatives," and then subjected to a number of screening criteria, which eliminated alternatives that did not meet project criteria or were operationally or technically infeasible. Remaining alternatives were evaluated in depth and a Preferred Alternative, along with a No Action and a Transportation Systems Management (TSM) Alternative, were selected for analysis in the Draft Environmental Impact Statement (DEIS).

NO ACTION ALTERNATIVE

The No Action Alternative includes improvements that will be implemented by the LIRR by 2010 and 2020. It includes projects that have been identified in MTA's 2000-2004 Capital Program and the LIRR's long-range plans, as well as projects sponsored by other transportation agencies that have received the same level of consideration. These initiatives include numerous improvements by Metro-North and NYCT, in addition to the following LIRR projects to be completed by 2010:

- An increase in peak hour train arrivals at Penn Station from the current 37 to 42;
- The addition of 23 additional dual-mode locomotives to the LIRR system;
- Replacement of the entire diesel-hauled fleet with a new fleet of bi-level coaches;
- The purchase of new rolling stock to expand the LIRR fleet and replace older cars;

- Plans to install a third Main Line track between Mineola and Hicksville;
- Yard and shop expansion and improvement projects;
- The gradual replacement of wood railroad ties with new concrete ties;
- Substantial improvements to the LIRR's Jamaica Station and Atlantic Terminal at Flatbush Avenue, in Brooklyn;
- The improvement and expansion of parking lots at LIRR stations throughout the system
- The rehabilitation of the East River Tunnels;
- The systemwide improvement of communications, traction power, and signaling systems; and
- The elimination of at-grade crossings from Mineola to Hicksville.

TRANSPORTATION SYSTEMS MANAGEMENT (TSM) ALTERNATIVE

The TSM Alternative consists of a number of improvements, not currently planned for construction or operation, to maximize the use of the existing transportation system without major capital expenditures. It contains three major transportation elements:

- Increasing the number of rail cars on LIRR trains by 2 to 4 cars, up to the limit of 12 rail cars, which is the maximum LIRR platform length. This initiative would require lengthening selected station platforms to accommodate the longer trains, as well as some other minor improvements.

- Increasing LIRR service to the Hunterspoint Avenue and Long Island City stations. This component would add a total of six additional trains from various LIRR branches, terminating at either Hunterspoint Avenue or Long Island City. As part of this component, pedestrian improvements would be made at both terminal stations and ferry service between Long Island City and Manhattan would be increased.

- Extending the existing westbound morning contra-flow lane on the Long Island Expressway (LIE) that currently operates in the morning peak period between the Queens-Midtown Tunnel toll plaza and Greenpoint Avenue in Queens. The AM-only westbound contra-flow lane would be extended 3.6 miles to the east, to 102nd Street in Corona, Queens near the Grand Central Parkway interchange. This would improve morning peak hour travel time for Queens express bus service to Manhattan by using one lane on the eastbound side of the LIE for westbound bus and taxi service.

The TSM Alternative is estimated to cost $655.6 million (in dollars escalated to the midpoint year of construction).

PREFERRED ALTERNATIVE

The Preferred Alternative would establish a direct link from the LIRR Main Line and Port Washington Branch to GCT. As shown in Figure S-2, the new service would branch away from existing LIRR tracks at Sunnyside Yard in Queens and travel in tunnels beneath Sunnyside Yard and LIRR's Yard A. It would continue in the currently unused lower level of the existing 63rd Street Tunnel beneath the East River. In Manhattan, the service would continue west from the tunnel's terminus at Second Avenue and 63rd Street, in one of two possible tunnel configurations (referred to as Option 1 and Option 2, and described below). In both options, service would head west toward Park Avenue and then south, beneath the existing MNR tracks under Park Avenue, into GCT. At GCT, the LIRR would have new tracks, platforms, waiting areas, ticket windows, and other services.

MANHATTAN ALIGNMENT

Two engineering options are currently being evaluated for the Preferred Alternative's Manhattan alignment. These are described below (and, where environmental impacts of the two options differ, these differences are described throughout this document).

Option 1: Station in Existing Lower Level of GCT

This option of the Preferred Alternative would create a 10-track, five-platform LIRR terminal in the existing lower level track area of GCT, in an area currently occupied by Metro-North platform and storage tracks and known as "Madison Yard." Five of the tracks would be stub-ended and the other five would connect on their southern ends to the existing GCT lower level loop track, which curves back around to the north and would be connected to new Queens-bound LIRR tracks. Option 1 would also create new LIRR concourse areas on a number of levels within GCT, including new escalators into the Biltmore Room on GCT's Main Concourse level, along with five new street entrances to the LIRR terminal between 45th and 48th Streets.

Leaving GCT to the north, the 10 LIRR tracks would combine together to form three tracks by 51st Street. North of 51st Street, these three tracks would gradually descend in new tunnels beneath buildings west of Park Avenue and below MNR's tracks under Park Avenue. At 53rd Street, the three main LIRR tracks would pass above the E and F subway lines, while two loop tracks on the east side of Park Avenue would pass below the subway. From 55th Street northward, the new LIRR tracks would travel in five tunnels beneath MNR's tracks below Park Avenue. The tracks would gradually curve eastward at approximately 59th Street and continue eastward, passing beneath the N and R and Nos. 4, 5, and 6 subway lines to meet the existing 63rd Street Tunnel at Second Avenue, approximately 140 feet below the street (see Figure S-3).

Option 2: New Deeper Station in GCT

Option 2 would have 10 stub-ended LIRR tracks served by five center-island platforms for new LIRR trains at GCT. However, these new tracks and platforms would be located on a new, deeper level some 65 feet (about 6 stories) below GCT's lower-level tracks. Each platform would have stairs and escalators rising to east-west passageways just above the platforms. From these connecting passageways, stairs and escalators would rise to a large mezzanine for the LIRR. Option 2 would provide a connection directly into the GCT Dining Concourse. It would not connect into the Biltmore Room. The new mezzanine area would occupy the westernmost track area of GCT's lower level—the same area that would be used for LIRR's new tracks and platforms under Option 1. Option 2 would create five new street entrances to the LIRR mezzanine between 44th and 48th Streets (four of these would be the same as in Option 1).

As the project route departs GCT to the north, the 10 tracks would join together to form two tracks between 48th and 55th Street. These two tracks would continue north in two tunnels approximately 125 feet deep below Park Avenue. At approximately 58th Street, the tunnels would gradually curve eastward, passing beneath the N and R and Nos. 4, 5, and 6 subway lines and joining the existing 63rd Street Tunnel at Second Avenue (see Figure S-4).

63RD STREET TUNNEL

The Preferred Alternative would use the currently unused lower level of the existing 63rd Street Tunnel, which runs from Second Avenue at 63rd Street in Manhattan to approximately Northern Boulevard at 41st Avenue in Queens.

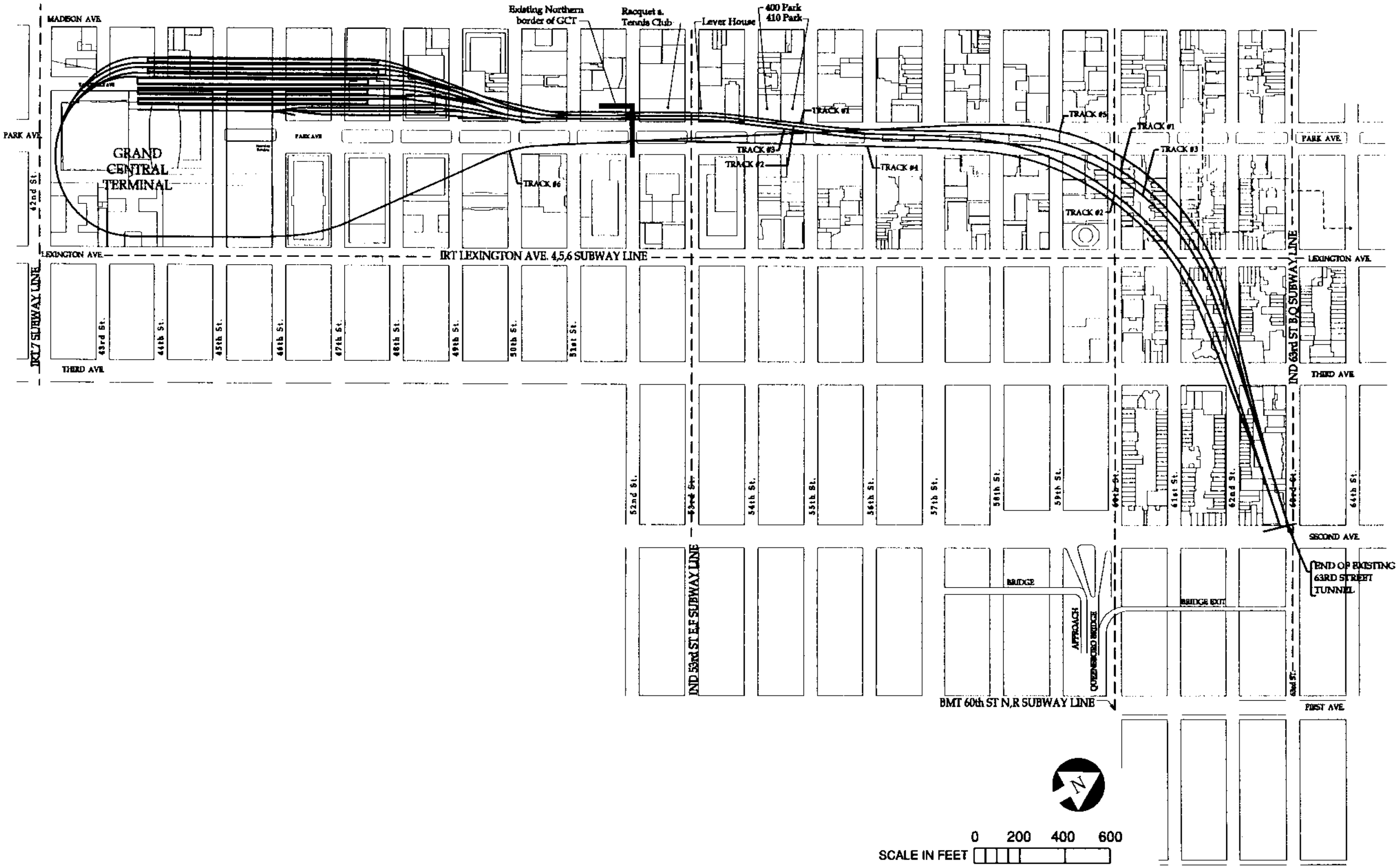


Figure S-3
Manhattan Alignment: Option 1

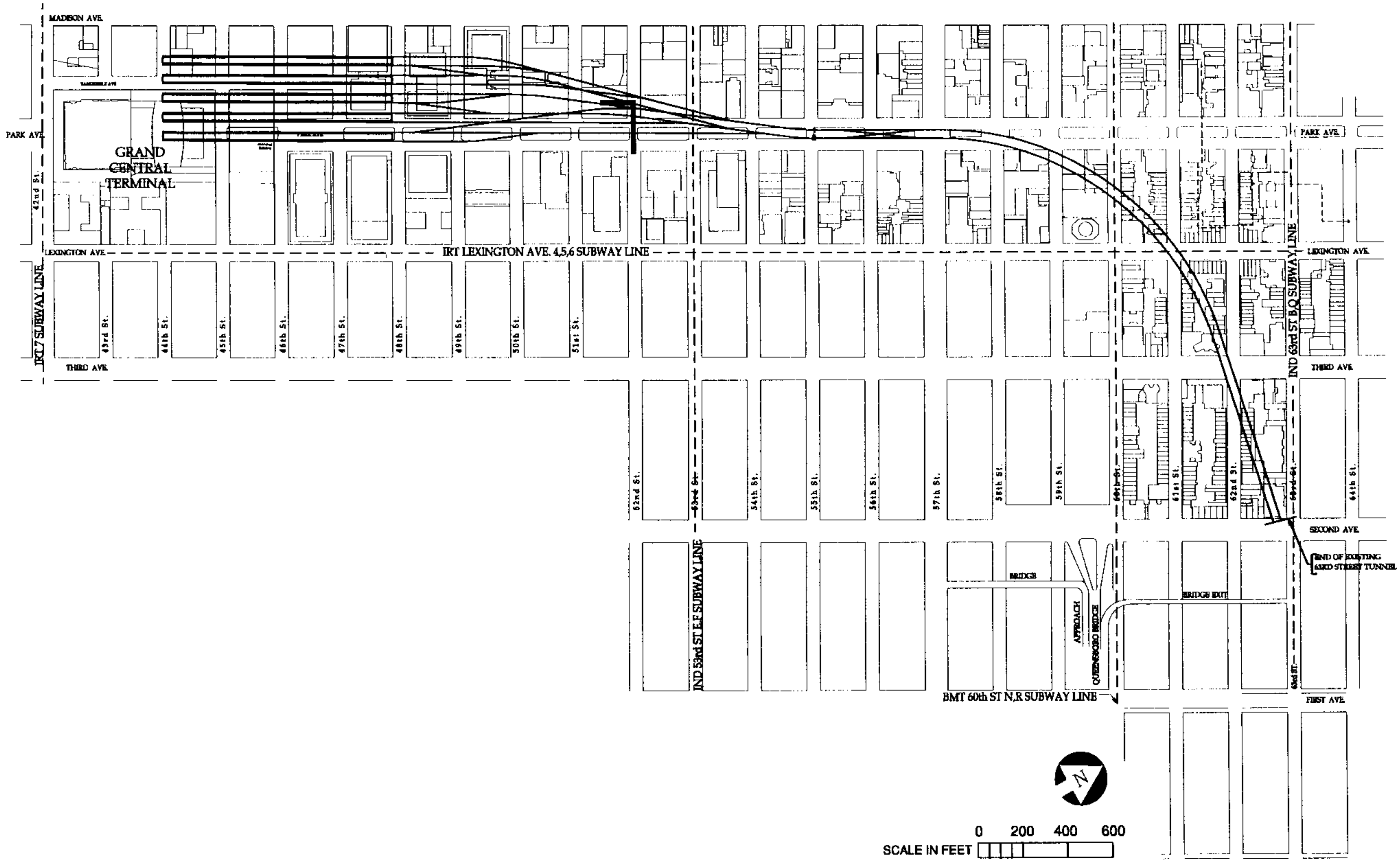


Figure S-4

Manhattan Alignment: Option 2

QUEENS TUNNELS

The Preferred Alternative would continue eastward from the lower level of the 63rd Street Tunnel to meet the LIRR's Main Line and Port Washington tracks in Harold Interlocking, just south of Sunnyside Yard (see Figure S-5). Harold Interlocking is the 1.5-mile stretch of track—and the associated switches and crossovers—shared by LIRR, Amtrak, and NJ Transit and providing access to and from the East River Tunnels, Sunnyside Yard, LIRR's Main Line and Port Washington Branch tracks, and Amtrak's route to and from New England over the Hell Gate Bridge. Two new LIRR tracks would continue from the existing 63rd Street Tunnel, run under Northern Boulevard (and beneath the E, F, G, and R subway lines that run under Northern Boulevard as well as the elevated N subway line above Northern Boulevard), and then fan out under Yard A and Sunnyside Yard into five separate tunnels. After crossing beneath the railroad yards, the tracks would ascend, emerging from the five tunnels to join the tracks at Harold Interlocking as well as a new loop track into the yard that provides access to storage tracks at Sunnyside Yard and Yard A. Yard A would be used as the site for maintenance and midday storage of LIRR East Side Access trains.

NEW SUNNYSIDE STATION

In addition to the new service to GCT, East Side Access would also create a new station in Sunnyside, Queens. Selected LIRR trains bound to and from Penn Station would stop at this new station located below the Queens Boulevard bridge, which crosses over the LIRR Main Line tracks and Sunnyside Yard. In the future, this station could also be used for Amtrak and/or NJ Transit service.

OTHER PROJECT ELEMENTS

In addition to the main LIRR train route from Harold Interlocking to GCT, the Preferred Alternative would include a number of related improvements and changes, as follows:

- *Harold Interlocking Improvements*. East Side Access would make modifications to Harold Interlocking that would create added capacity and flexibility and reduce existing operational conflicts between the LIRR, Amtrak, and NJ Transit. The proposed work at Harold Interlocking would essentially separate the tracks used by Amtrak/NJ Transit and the LIRR.
- *Replacement Facilities for Metro-North*. To replace the MNR train storage yard ("Madison Yard") in the western portion of the lower level of GCT, which is to be used for LIRR facilities, the Preferred Alternative would create new storage tracks and maintenance facilities for Metro-North trains at Highbridge Yard, in the Bronx.
- *Replacement Facilities for New York & Atlantic Railway (NYAR)*. LIRR's Yard A, in Sunnyside, is currently used by NYAR, a rail freight service, as a rail car storage and maintenance facility. To replace NYAR facilities that would be displaced from Yard A for storage of LIRR trains, the Preferred Alternative would create new storage capacity in Queens, potentially at either Blissville or Maspeth Yard; and a new maintenance facility, potentially at Fresh Pond Yard, also in Queens.
- *Substations*. Six electric substations, connected to local utilities, would be constructed to supply electric power to LIRR trains serving GCT. Each substation would be located in an existing structure and/or underground.

- *Ventilation*. Ventilation plants would provide fresh air to East Side Access's tunnels and underground spaces, including passenger areas, and would remove smoke in the event of a fire. Options 1 and 2 would have different vent plants to serve their differing station layouts and track alignments in Manhattan. Most would be under the street, with gratings and maintenance/exit hatches in the sidewalk.

  Option 1 would create four ventilation plants in Manhattan: at 47 East 44th Street, replacing an existing 5-story building; under East 54th Street between Park and Madison Avenues and between Park and Lexington Avenues; and within the existing 63rd Street Tunnel ventilation plant at Second Avenue and 63rd Street. Option 2 would also have four ventilation plants in Manhattan: at 47 East 44th Street, where this option would also include the mechanical equipment required to provide climate control for this option's new lower-level mezzanine; within the lower level of GCT from 48th to 49th Street; under 55th Street between Park and Madison Avenues; and in the existing structure at Second Avenue and 63rd Street. The Preferred Alternative would use the existing 63rd Street ventilation facilities on Roosevelt Island and along the tunnel route in Queens, and would create one new ventilation facility beneath the LIRR's Yard A, on top of the new tunnel structure.

CONSTRUCTION METHODS

For many of its components, the Preferred Alternative would require construction of underground spaces in the form of tunnels and caverns. Most of this work would be done underground, with limited disruption at the surface. The Preferred Alternative would select among a variety of methods to construct these spaces: tunnel boring machines (TBMs) could construct some tunnels in both rock and soft ground for train routes deep underground, and drill-and-controlled-blasting could be used to excavate both single-track tunnels and larger underground spaces. Areas of cut-and-cover excavation would also be required.

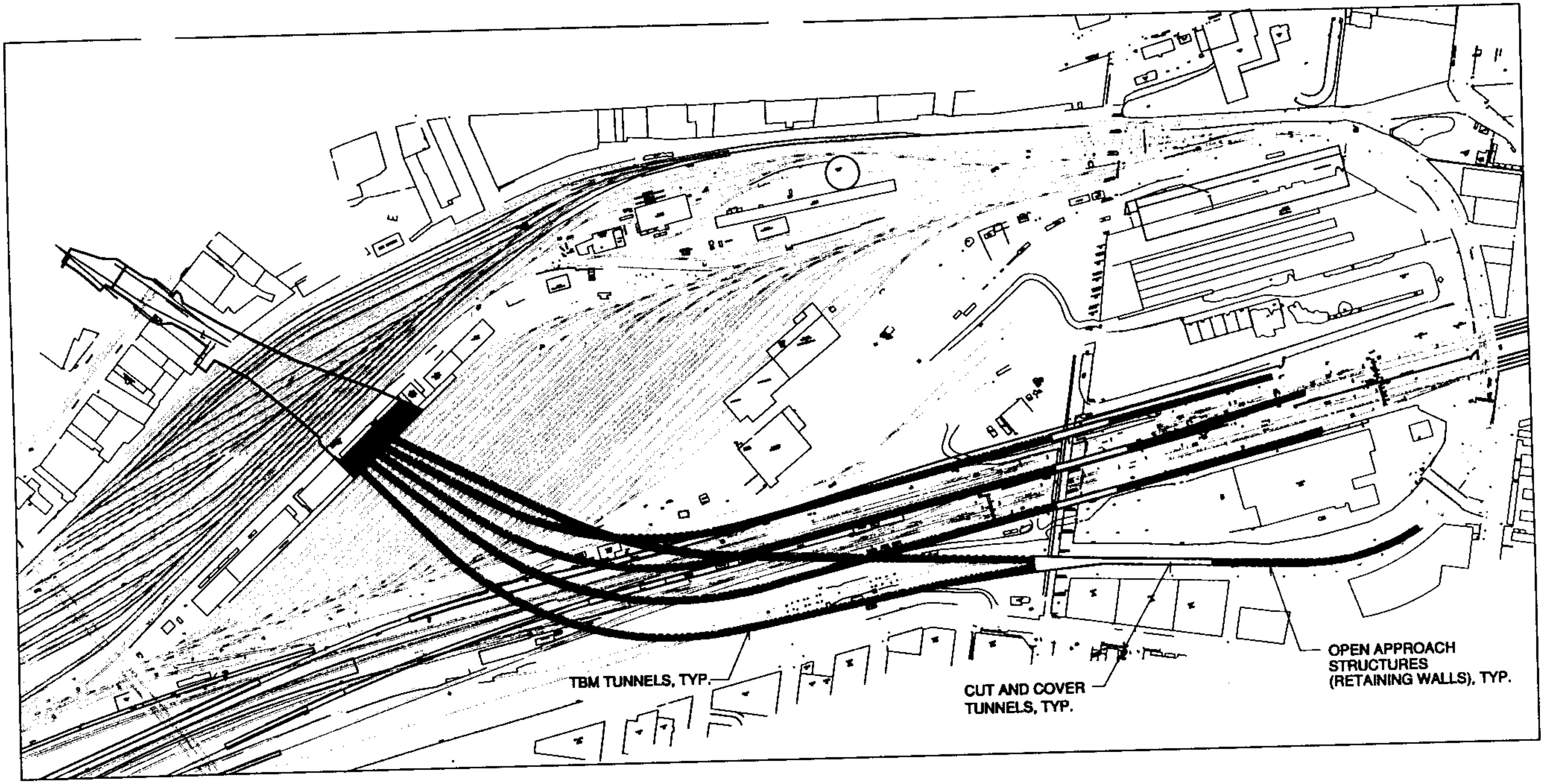
Manhattan Tunnels

Tunnels in Manhattan may be excavated in one of two ways: with a TBM or via drill-and-controlled-blast methods. TBMs are large diameter drills that excavate circular tunnel sections. TBMs are custom designed and built for project-specific geology and for the specific requirements of the project being constructed. The TBMs for the Manhattan tunnels would be designed for the hard, abrasive rock conditions that are anticipated. They would have a diameter of approximately 22 feet, the size required to excavate the single-track tunnels for the LIRR. As the TBM excavates the tunnel, rock supports would be installed behind the TBM cutter head. After the tunnel is excavated and supported, a final tunnel lining would be placed.

For the drill-and-controlled-blast method, a large number of small diameter holes are drilled into the rock face and loaded with explosives. The explosives are then detonated, fragmenting the rock. Controlled blasting techniques involve the judicious use of these explosives to excavate the required openings underground. Controlled blasting allows the contractor to excavate the openings with the least possible disturbance of the remaining in-place rock and with low potential ground vibration and air blast at nearby structures. During the course of a typical day, a very small number of blasts would take place.

Queens Tunnels

Two types of construction would be used to construct the tunnels from the existing 63rd Street Tunnel beneath Yard A and Sunnyside Yard. From the existing 63rd Street Tunnel to the


TBM TUNNELS, TYP.
CUT AND COVER TUNNELS, TYP.
OPEN APPROACH STRUCTURES (RETAINING WALLS), TYP.

LEGEND

■	TBM TUNNELS
☐	CUT AND COVER TUNNELS
■	OPEN APPROACH STRUCTURES (RETAINING WALLS)

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SCALE IN FEET

Figure S-5

Queens Tunnels - Overall Plan

buildings at the northern edge of Sunnyside Yard, tunnels would be excavated from the surface using the cut-and-cover method. Cut-and-cover construction involves excavating down from the street level and installing temporary decking above the excavation area to permit traffic and/or pedestrians to use the street and sidewalk above while construction continues underneath. At Yard A, the excavation area would be enclosed with virtually watertight walls, allowing work on the tunnels within the construction area to proceed without the need for dewatering.

Beneath Sunnyside Yard, tunnels would be constructed using both a TBM (for areas under Sunnyside Yard). As the tunnels rise to meet the existing tracks, cut-and-cover and open-cut excavation would be used. The varied subsurface conditions beneath Sunnyside Yard (a mixture of rock and soft soils) would require the use of one of two types of TBMs: either an earth pressure balance tunnel boring machine, or a slurry shield TBM. Both types of TBM use pressure at the tunnel face to prevent soil settlement and groundwater seepage.

Other Elements

To create ventilation facilities in the vicinity of Park Avenue in Manhattan and new entrances to GCT, cut-and-cover methods would be used. This would require closing portions of the street and sidewalk for construction, in some cases until the excavation is deep enough to install temporary decking, and in other cases for the duration of construction.

At Northern Boulevard in Queens, as well as in a number of places for Option 1 in Manhattan, existing above-ground and subsurface structures would have to be supported to allow for construction of elements of the Preferred Alternative. These areas include the underground and elevated subway lines along Northern Boulevard, columns in GCT (Option 1 only), buildings along the western edge of Park Avenue between 52nd and 55th Streets (Option 1 only), and the MNR Park Avenue tunnel from 54th to 56th Streets (Option 1 only). This would be accomplished by underpinning their foundations. Underpinning is a common construction technique that involves placing new foundations under an existing building to allow construction to occur in the area of the original foundations.

PREFERRED ALTERNATIVE COSTS

Capital costs for the Preferred Alternative are estimated at $4.7 billion for Option 1 and $4.3 billion for Option 2 (in midpoint of construction dollars). Total capital costs include costs of construction, costs for engineering and management, costs to purchase additional rolling stock (220 new M-7 rail cars), and costs for property acquisitions and easements required for the project.

D. SUMMARY OF IMPACTS AND MITIGATION

The No Action Alternative would not benefit users of the regional transportation network. Without substantial improvements to the transportation system, it would aggravate already poor conditions on all modes of transportation. As a result, the No Action Alternative would result in adverse impacts on land use, social conditions, and economic conditions throughout the Long Island Transportation Corridor, or LITC (which includes Manhattan, Brooklyn, Queens, and Nassau and Suffolk Counties). It would also result in adverse impacts in terms of transportation service and regional air quality. With a potential deterioration in rail transit service under the No Action Alternative, access throughout the region would become more difficult and the expected population and employment growth would likely occur with difficulty. On Long Island, where use of the LIRR is greatest, the decrease in quality of LIRR service would be felt most strongly and would support a trend toward sprawling development and an area characterized by increased dependence on the automobile. In addition, without improvements to mass transit service, traffic congestion and regional air pollution would increase.

The TSM Alternative would have small benefits for LIRR riders who work in East Midtown Manhattan or Long Island City, in Queens, by offering additional service to western Queens and some additional capacity on LIRR trains into Penn Station. Like the No Action Alternative, without substantial improvements to the regional transportation system, the TSM Alternative would also have adverse effects on land use, social conditions, and economic conditions, although these would be less severe than with the No Action Alternative. Again, the predicted increases in population and employment would likely occur only with difficulty. In Manhattan, the existing disconnect between the location of jobs and commuter terminals would not be corrected, and improvements would not be sufficient to avoid the overcrowding and delays that are likely to occur in the future.

In contrast, the Preferred Alternative would greatly improve transportation service in the LITC, and would therefore support land use patterns, social conditions, and economic conditions. It would provide a substantial benefit to LIRR passengers, including not only those who use the new service to GCT, but also those who continue to travel to Penn Station and new commuters who currently use other modes of transportation. The population and employment predicted to occur throughout the region would be supported by this improvement, resulting in significant beneficial impacts to the region's economy. Regional vehicle miles traveled (VMT) would decrease overall, resulting in improvements to air quality as well. At the same time, the Preferred Alternative would result in some localized impacts related to the provision of new service. Most of these would occur during construction of the project, and therefore would be temporary, although some would occur as a result of project operations. The Preferred Alternative's effects on the full range of environmental impacts are summarized below and presented in Table S-2.

LAND USE, ZONING, AND PUBLIC POLICY

The East Side Access Project is not expected to have major effects on land use in Manhattan. Both GCT and Penn Station lie within the Midtown commercial center, surrounded by dense, predominantly commercial uses. Although the project could make the area around GCT more attractive as a commercial district, it is an extremely desirable area now, but with few sites available for development. At Penn Station, the diversion of LIRR riders to GCT would have only minor, localized effect. Under the No Action and TSM Alternatives, these passengers would arrive in Penn Station, but travel to the area near GCT to reach their destinations.

The Preferred Alternative's Sunnyside station would support the city's plans to create a Central Business District (CBD) in Long Island City. The No Action and TSM Alternatives would offer no beneficial secondary impact in Long Island City. None of the project alternatives would affect land uses in the areas surrounding the sites that may be used for NYAR.

The effects of the Preferred Alternative on land use on Long Island would be generally beneficial. By attracting new patrons to the LIRR, this alternative would reduce congestion on the area's highways, resulting in improved access to land uses. The alternative would support county land use policies that seek to concentrate future growth in established areas, make efficient use of the transportation network, and revitalize existing town centers. Increased

Table S-2

Summary of Impacts and Mitigation Measures for the Preferred Alternative

Analysis Area	Potential Significant Adverse Impacts	Mitigation	Unmitigated Impacts
Land Use, Zoning, and Public Policy	None	None required	None
Social Conditions	Temporary impacts on neighborhood character during construction at selected locations: • In Manhattan at 52nd, 53rd, and 54th Streets under Option 1 • In Manhattan at 55th Street under Option 2 • In Queens at Barnett Avenue if buildings are removed for construction staging	In Manhattan, partial mitigation through maintenance and protection of traffic plan. In Queens if buildings are removed, temporary noise wall during construction; replace buildings after construction.	Temporary disruption in Manhattan could be only partially mitigated.
	Temporary impact to Long Island City High School near 41st Avenue during construction	The school would be shielded from construction activities as much as possible, and the project would work with the high school to resolve problems.	Temporary disruption at school could only be partially mitigated.
Economic Conditions and Relocation	Displacement and relocation of businesses and private garages Subsurface easements	Acquisition of properties under the federal Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970	None
Visual and Aesthetic Considerations	Potential for impacts in Queens if buildings along Barnett Avenue are removed	If buildings are removed, temporary noise wall during construction; replace buildings after construction	None
Historic Resources	Changes to historic features of Grand Central Terminal: • Under Option 1, changes to Biltmore Room, Biltmore Passage, and portion of Dining Concourse; new ticket windows • Under Option 2, new mezzanine in area of tracks and platforms at western end of Dining Concourse level	Ongoing consultation regarding design features and construction work with the State Historic Preservation Office (SHPO) as required by Section 106 of the National Historic Preservation Act	None
	Potential changes to the context of historic resources from project elements in Manhattan (new entrance near Vanderbilt Concourse building and new vent building on 44th Street adjacent to Yale Club)	Ongoing consultation with SHPO	

Table S-2 (Continued)
Summary of Impacts and Mitigation Measures for the Preferred Alternative

Analysis Area	Potential Significant Adverse Impacts	Mitigation	Unmitigated Impacts
Historic Resources (continued)	Potential impacts during construction to historic resources near the construction work: • Under either option, construction work in GCT • Under either option, construction work adjacent to Vanderbilt Concourse building and Yale Club • Under Option 1, work beneath Racquet & Tennis Club and Lever House • Work near Office and Switch Tower Q in Sunnyside Yard	Construction protection plan to be implemented in coordination with SHPO	
Archaeological Resources	Disturbance of possible buried archaeological resources during construction	Ongoing consultation with SHPO; additional work to determine whether archaeological resources are located in construction areas, once preliminary engineering is under way	None
Transportation	Congestion from vehicular traffic at certain intersections near GCT and LIRR stations in eastern Queens and on Long Island	Standard traffic improvement measures	None
	Parking shortfalls at certain LIRR stations	Various measures as part of LIRR parking improvement program	Partially unmitigated
	Impacts on Lexington Avenue (4,5,6) subway	Improvements to station elements (e.g., new turnstiles, stairs, wider corridor) and improving throughput of trains	Some impacts remain partially unmitigated
	Pedestrian impacts in and around GCT	Various improvements (e.g., widen crosswalks, adjust escalator operations)	None
	Impacts on Metro-North Railroad operations during construction of Option 1	Implementation of Option 2 avoids impacts	Under Option 1, temporary impacts unmitigated
	Impacts during construction at 52nd, 53rd, 54th Streets under Option 1; Impacts during construction at 55th Street during construction of Option 2	Maintenance and protection of traffic plan	Temporary impact remains partially unmitigated
Air Quality	De minimis increase in carbon monoxide at Madison Ave and 48th Street from increased congestion	The same measures to be used for vehicle congestion (above)	None

Table S-2 (Continued)
Summary of Impacts and Mitigation Measures for the Preferred Alternative

Analysis Area	Potential Significant Adverse Impacts	Mitigation	Unmitigated Impacts
Noise and Vibration	Based on FTA criteria, noise impacts in Queens and Long Island along right-of-way at selected locations from increases in train service. However, noise level increases under build conditions would be imperceptible compared to No Action levels	Mitigation would require extensive use of noise walls, which is not practicable	Noise impacts would be unmitigated
	Ground-borne noise impacts in Manhattan from operation under Option 1	A range of track fixation methods, including resilient ties, pads, and fasteners, and floating slabs at select locations	None
	Ground-borne noise impact from operation of new service in Queens	Most impacts mitigated with resilient ties, pads, and fasteners. One or two locations could require ballasted track, ballast mats, or a floating slab	None
Energy	None	None required	None
Utilities	Potential conflicts on existing utilities during construction	Relocate affected utilities and maintain service	None
Contaminated Materials	Potential exposure to contaminated materials during construction	Implementation of Health and Safety Plan	None
Natural Resources	Potential erosion and stormwater impacts during construction	Implementation of project design elements to control stormwater	None
Safety and Security	None	None	None

patronage on the LIRR would support land uses around local train stations and focus development on town centers, promoting a more efficient and centered land use pattern. The No Action and TSM Alternatives would provide no such beneficial land use impact on Long Island. Development patterns would continue as urban sprawl with no impetus to alter land use patterns.

SOCIAL CONDITIONS

Effects on social conditions relate to changes in service and access for the area's residents and workers, access and support to community facilities and recreational opportunities, and community character. In general, the No Action Alternative would result in adverse effects on social conditions throughout the LITC, the TSM Alternative's effects would be somewhat less adverse, and the Preferred Alternative would generate beneficial effects.

With a potential deterioration in rail transit service predicted under the No Action Alternative, access throughout the region would become more difficult and inconvenient, supporting a trend toward an area characterized by increased dependence on the automobile. Although it would slightly improve transportation service to East Midtown Manhattan, the TSM Alternative overall would have little effect on access to regional community facilities or neighborhood character.

In contrast, by greatly improving service to Manhattan and to Sunnyside, Queens from eastern Queens and Long Island, the Preferred Alternative would benefit all corridor residents and would improve access to the region's community facilities. In addition, because the Preferred Alternative would succeed in diverting to the LIRR some commuters who would otherwise drive to work, it would support transit-centered development and help to shift the trends that currently favor suburban sprawl and automobile dependence.

ECONOMIC CONDITIONS

The Preferred Alternative would result in the direct displacement and required relocation of a small number of employees and businesses as a result. These effects are likely to be localized. Regarding overall economic conditions, The No Action Alternative's potential effects would be adverse, the TSM Alternative's less so, and the Preferred Alternative's beneficial, as summarized below.

Since the projections of population and employment for the LITC assume no deterioration in transportation service, under the No Action Alternative and even the TSM Alternative, these predicted growth levels might not be achieved. On Long Island, this could mean fewer new residents and possibly lower employment with a concomitant effect on the future local tax base and economic activity. Overall, the No Action Alternative could affect the attractiveness of the LITC, and particularly Manhattan, as a business location, undermining the projected employment growth for the region and the economic demand that would be generated by future employees. The improvements with the TSM Alternative would not be sufficient to avoid the overcrowding and delays that are likely to occur in the future, and would not correct the imbalance between LIRR commuters' terminus at Penn Station and the location of many of their jobs in East Midtown.

The Preferred Alternative's substantial improvements to transportation service would eliminate the existing disconnect between the location of jobs and location of terminals, as well as provide substantial relief from the currently overcrowded conditions on many LIRR peak hour trains, and considerable reduction in the time required for the journey to work. Non-LIRR users would also benefit, since the diversion of auto commuters to the train would reduce congestion on the major Long Island roadways leading to Manhattan.

With the Preferred Alternative, the rail transit system would be adequate to serve the region with the economic growth that is currently projected. Therefore, compared with the No Action Alternative the Preferred Alternative would have a clear positive impact on productivity within the LITC, and particularly in Manhattan. Balancing the locations of jobs and the LIRR terminals, improving transportation service, reducing travel time, and improving the quality of life would provide the transportation support that is needed for the region, particularly Manhattan, in light of its projected growth in employment. The investment proposed under the Preferred Alternative would count heavily to support the LITC and Manhattan, in particular, as a viable location for business growth.

The location of a new LIRR station in Sunnyside would increase accessibility to the area for the Long Island work force and thus enhance opportunities for future growth in Long Island City, where nearly 4 million square feet of office space are currently planned. Expanding direct links to the work force in a wider region would make Long Island City a more attractive location for the growing service industries in the area, particularly business services, since a larger labor pool with a broader range of skills would be more readily accessible.

Long Island would also benefit from the Preferred Alternative. The attraction of an area as a business location is not only based on the transportation infrastructure, but also on the availability of the work force. Since transportation on Long Island is a problem in every mode, investing in LIRR infrastructure is likely to improve the quality of life on Long Island for users and non-users of the system alike, i.e., improved rail service would also reduce traffic congestion, both of which would support the attraction of Long Island as a desirable residential location.

VISUAL AND AESTHETIC CONSIDERATIONS

Project elements of the TSM Alternative that are anticipated to be visible would not significantly alter the visual character of the project sites, nor block views of visual resources, and would therefore not negatively affect the visual character of the surrounding areas in visual proximity.

Overall, most Preferred Alternative project elements, including visible work within Grand Central Terminal, would have no significant adverse visual impacts on GCT since the work would not adversely affect the overall visual character of GCT. Proposed work around GCT, including construction of a new above-ground ventilation facility and new pedestrian facilities, would not alter the context of the study area around GCT as a mix of new and old buildings, and therefore would not constitute significant adverse effects. The proposed work within the four replacement rail yards being considered—Blissville, Maspeth, Fresh Pond, and Highbridge Yards—would not be visually prominent.

Most work in Queens would occur within the existing Sunnyside Yard/Yard A rail yard complex, and would not significantly alter the visual character of the surrounding areas nor affect any significant visual resources. At Barnett Avenue between 43rd and 48th Streets, if the project requires demolition of existing structures, this would remove visual barriers along the Amtrak and LIRR right-of-way. To avoid adverse impacts if these structures are demolished, a temporary wall would be erected during construction. Once the project is complete, buildings would be replaced in kind.

HISTORIC RESOURCES

Construction of the Preferred Alternative would involve physical alterations to three known historic resources. Option 1 and Option 2 construction activities would be located within the public areas of Grand Central Terminal itself and terminal's track area, and the Racquet & Tennis Club and Lever House would be underpinned to support their foundations for Option 1. Although design specifications would be sufficiently stringent to ensure that no adverse impacts would occur to these resources, a construction protection plan, to be developed in consultation with State Historic Preservation Office (SHPO) at the New York State Office of Parks, Recreation and Historic Preservation and approved by SHPO prior to the start of construction, would be implemented. Since the proposed underpinning would not be visible once the project is operational, there would be no contextual impacts to the Racquet & Tennis Club and Lever House. To avoid contextual effects for work within GCT, including the new escalators in to the Biltmore Room under Option 1, any significant architectural or decorative features, if located in areas of proposed construction, would be retained as part of the project design and plans submitted to SHPO for review and approval.

In addition, proposed project construction would be located adjacent to or near three historic resources—the Yale Club in Manhattan, and Switch Tower Q (formerly Signal Cabin Q, Yardmaster's Office) and the Office (formerly Signal Cabin F) located in Sunnyside Yard. No contextual effects on these resources are anticipated as a result of the proposed project. To avoid potential physical effects on the Yale Club from construction of a proposed adjoining ventilation facility, and to avoid potential physical effects from the proposed Harold Interlocking work and construction of the new Sunnyside station on the two Sunnyside Yard buildings, these historic resources would be included in the construction protection plan to be approved by SHPO prior to the start of construction. The work proposed at Harold Interlocking between 43rd and 48th Streets would not have an adverse impact on the nearby Sunnyside Gardens Historic District.

As preparation of a FEIS and subsequent preliminary engineering proceed, ongoing consultation will be undertaken with SHPO and with the federal Advisory Council on Historic Preservation.

ARCHAEOLOGICAL RESOURCES

For the Preferred Alternative, potentially sensitive prehistoric areas were identified in all the project areas of potential effect (APEs)—the Manhattan alignment, the Queens alignment, Roosevelt Island, and Blissville, Maspeth, Fresh Pond, and Highbridge Yards. Areas of potential historic-period archaeological sensitivity were identified in the Queens alignment and Highbridge Yard APEs. As project plans proceed with the preparation of an FEIS and preliminary engineering, ongoing consultation will be undertaken with the SHPO, and, if required, with the federal Advisory Council on Historic Preservation. Additional work will be performed where the potential for significant impacts to archaeological resources has been identified for the project components. This includes performing soil borings in the locations of proposed construction activities. Upon completion of the soil borings, impacts would be reevaluated based on indication of potential sensitivity. If required, appropriate mitigation measures would be developed through consultation with SHPO, including Stage 1B testing, Stage 2 resource assessment of National Register eligibility, and Stage 3 data recovery, if required.

TRANSPORTATION

The Preferred Alternative would substantially improve regional transportation service in the LITC. In terms of regional travel, the project would provide an overall benefit by improving transportation service from Long Island and eastern Queens to Manhattan and Queens. It would provide commuters destined for Manhattan with increased and improved train service—there would be a nearly 50 percent increase in the number of trains (19 additional trains) into Manhattan in the peak hour compared to the No Action condition, greater availability of seats, and the flexibility to get directly to the East Side of Midtown Manhattan in addition to the West Side. It would reduce auto commutation into Manhattan as well, by diverting auto trips from eastern Queens and Long Island, to the LIRR. Overall, the Preferred Alternative would reduce total daily vehicle miles traveled (VMT) by about 342,000 in 2010 and by 375,000 in 2020. There would be 11,000 fewer daily auto trips to work in 2010, and 12,000 fewer daily trips in 2020. Background traffic in the overall Midtown area would decrease by 2 percent, and parking demand in Manhattan would decline by approximately 3,000 vehicles or more on a typical weekday.

At the same time, the project could result in localized impacts on other transportation elements. These would include the potential for increased traffic at intersections surrounding GCT, where the number of taxis would increase; more crowded pedestrian conditions along sidewalks and at intersections immediately surrounding GCT; and an increased demand for service along the Lexington Avenue subway line, as well as some crowding on subway station platforms, in mezzanines, and on vertical circulation elements in the station. However, these increases in pedestrian, subway, and taxi activity at GCT would be offset by decreases in such activity in the Penn Station area, where passenger movements would be less congested, vehicle traffic on the street network would be less congested, and crowding in subway stations and on subway lines would be eased. Impacts would also include increased traffic and parking at LIRR stations in eastern Queens and on Long Island, where the number of riders is projected to increase because of the Preferred Alternative.

GRAND CENTRAL TERMINAL AND SURROUNDING AREA

In the area surrounding GCT, all of the local traffic impacts could be mitigated with standard traffic improvement measures, such as signal phasing and timing modifications, more restrictive parking regulations, and by providing exclusive phases for turning movements at some intersections where there are significant conflicts with high volumes of pedestrians.

Other local effects of the Preferred Alternative would include increases in ridership and related impacts on the Lexington Avenue subway line and increases in the number of pedestrians in and around the terminal. The subway impacts include overcrowding on several subway station elements (e.g., stairs, escalators, entrances, etc.) and an increase in demand on the "line haul," or the number of passengers on the trains entering and leaving the station during the peak hours. Mitigation of the subway impacts includes a series of improvements to increase usage of currently underutilized areas within the transit system such as the "free" passageway connecting the 42nd Street Shuttle with the Lexington Avenue line, strategic placement of control agents to divert passenger flows to paths with available capacity, new stairwells, additional turnstiles, removal of impedances to smooth passenger flows on the subway platforms, and increasing the number of trains through the station in the peak hour. The overall mitigation strategy aims at generating more balanced use of passageways, stairwells and escalators to create a more balanced distribution of passengers to, from, and within the subway station. It would partially mitigate impacts. Mitigation measures would continue to be investigated through the FEIS to determine their feasibility and efficacy.

The increases in pedestrian flows in GCT would not result in significant adverse impacts. In one location, it is recommended that an existing escalator bank, which operates with one escalator up and one down at all times, be operated with both escalators up in the AM peak period and both down in the PM peak period to accommodate increased pedestrian activity.

In the area surrounding GCT, the effects of increased pedestrian flow would be limited to locations near GCT, since most of these passengers would travel to the area from Penn Station under the No Action and TSM Alternatives. There would, nonetheless, be significant impacts requiring mitigation at several locations. Some 15-foot-wide crosswalks would need to be widened to 20 feet. At some locations, street furniture and other impediments to pedestrian flow would need to be cleared or limited. This could include sidewalk vendors, newspaper kiosks, and flower boxes, for example.

With the Preferred Alternative there would be reduced demand for several bus routes that connect Penn Station with the East Side, since LIRR commuters could take direct LIRR service to GCT. There would also be some ridership increases on East Side bus routes by LIRR commuters arriving at GCT who would need to transfer to other routes to get to their final destinations. It is NYCT's policy to adjust bus schedules and frequencies, within fiscal and operating constraints, as demand dictates.

The increases in pedestrian, subway, and taxi activity at GCT would be offset by decreases in such activity in the Penn Station area, where passenger movements would be less congested, vehicle traffic on the street network would be less congested, and crowding in subway stations and on subway lines would be eased.

LONG ISLAND CITY/SUNNYSIDE AND FLATBUSH AVENUE TERMINAL

The Preferred Alternative would generate a relatively small number of new LIRR riders at its proposed Sunnyside station during the peak commuting periods. It is anticipated that 90 percent of these LIRR commuters at Sunnyside would walk to their final destination in the area after alighting from LIRR trains, that 9 to 10 percent would transfer to subways or buses, and that less than 1 percent would take taxis or be picked up or dropped off by car. Significant adverse traffic and transportation impacts are not expected.

Under the TSM Alternative additional LIRR commuters would arrive at the Hunterspoint Avenue station, and the vast majority would then transfer to westbound IRT No. 7 Flushing line trains to Manhattan's East Side at the No. 7 line's Hunters Point Avenue station. These No. 7 trains are already operating at capacity, without room for additional passengers. A few new LIRR riders are projected to use the very infrequent LIRR service to its Long Island City station; many of these riders would also transfer to the No. 7 line at its Vernon-Jackson station.

Under the TSM Alternative additional LIRR riders would travel to the Flatbush Avenue terminal in downtown Brooklyn and transfer to the northbound Nos. 4 or 5 lines. Those lines are also subjected to serious crowding levels, and the addition of new LIRR commuters there would exacerbate those conditions.

EASTERN QUEENS AND LONG ISLAND

The analysis of potential impacts at LIRR stations focused in detail on 15 of the LIRR's stations in eastern Queens and Long Island, representing the range of all stations, including several of the busiest stations and others with more moderate usage, stations within local business districts and others closer to residential areas or in fringe areas, stations with multiple bus routes and others with limited service, and stations with extensive parking capacity and others with very limited parking availability. Potential traffic impacts were examined at the representative stations, while parking impacts were evaluated at all stations.

Traffic

Analysis of traffic conditions found several intersections with the potential for significant impact under the Preferred Alternative. All of these impacts could be mitigated via standard traffic engineering improvements, such as the installation of traffic signals at unsignalized intersections, signal phasing and/or timing modifications at signalized intersections, lane re-striping, offsetting centerlines of streets to gain additional capacity in one direction, and more restrictive parking regulations. These are standard measures within the day-to-day jurisdiction of the agencies responsible for maintaining traffic operations. Since the detailed traffic impact analyses were conducted for a representative set of stations, standard traffic engineering improvements would likely be sufficient to mitigate traffic impacts that might occur at any of the LIRR's numerous other stations.

Parking

The Preferred Alternative can be expected to increase parking demands at each of the LIRR's 124 stations. Several stations would be able to accommodate the demands, while others would experience significant parking shortfalls (in many cases, parking shortfalls would be expected even under the No Action Alternative). Depending on the individual station in question, mitigation of these shortfalls would include: expansion of existing lots or construction of new lots or garages; modification of train service and schedules to increase service at stations with available parking or where parking could be added more easily; institution of fare policy changes to attract riders to a new station by shifting one or more stations from one fare zone to another; increasing bus service or heavily subsidizing bus fares; implementation of new feeder bus services; improving kiss-and-ride facilities to increase pickup and drop-off activity rather than parking; providing preferential parking areas for car-poolers, with enforcement; construction of new stations near or between two major stations where parking demands greatly exceed parking availability; promoting bicycle use; and others. Ridership and parking projections would need to be closely monitored, and the LIRR would need to be ready to implement one or more of these strategies at individual stations.

AIR QUALITY

Air quality effects of the project result from changes in traffic patterns induced by modifications to travel patterns associated with the project. On a "mesoscale" or regional level, the Preferred Alternative would reduce the number of vehicular miles traveled and the related pollutant burdens of carbon monoxide, volatile organic compounds, compounds of nitrogen and oxygen, and small particulate matter. The Preferred Alternative would reduce vehicle-related pollutants about 3 to 5 times more than would the TSM Alternative. The TSM Alternative would increase pollutant burdens produced by the operation of diesel trains.

On a "microscale" or localized level, the Preferred Alternative would cause one *de minimis* impact on air quality in Manhattan, but this would be mitigated through the traffic mitigation measures. Overall, the Preferred Alternative would not result in significant air quality impacts and would conform to the New York State Implementation Plan for air quality.

NOISE AND VIBRATION

Under the No Action and TSM Alternatives, noise levels would increase at properties adjacent to the railroad right-of-way along some segments of the LIRR system as a result of increased service, implementation of the dual-mode service, and longer trains (this noise is referred to as "wayside noise"). The Preferred Alternative would increase train service throughout the LIRR service area. The increase in trains would result in significant wayside noise impacts, when compared to existing conditions. These impacts would, however, be imperceptible in comparison to the No Action Alternative. The impacts are predicted to occur on six segments of the LIRR system: Woodside to Jamaica, in Queens; Jamaica to Valley Stream, just across the Queens-Nassau County border; Jamaica to Floral Park, also just across the Queens-Nassau border; Floral Park to Mineola, in Nassau County; Mineola to Hicksville, in Nassau County; and Huntington to Port Jefferson, in Suffolk County. Mitigation for the predicted noise impacts would consist of extensive use of noise barriers along the rail right-of-way, which is not practicable.

In addition, the Preferred Alternative has the potential to result in significant ground-borne noise impacts (a perceptible rumbling sound caused by vibration of building elements) in Manhattan under Option 1 and in Queens along the project's tunnel alignment. However, the analysis conducted for this EIS was conservative, and it is expected that in many locations the existing ground-borne noise levels are high enough so that predicted levels would not be perceptible. For ground-borne noise in Manhattan, the impacts under Option 1 could be mitigated through the use of a range of track fixation methods, including resilient ties, pads, and fasteners, as well as floating slabs at select locations between 52nd and 55th Streets. Similarly, the ground-borne noise impacts in Queens could be mitigated through the use of such track fixation methods as resilient ties, pads, and fasteners, as well as floating slabs, ballasted track, and ballast mats in select locations.

ENERGY

Both the TSM and Preferred Alternatives would reduce the regional vehicle miles traveled (VMTs) and therefore would reduce related energy consumption. This decrease would be offset slightly under the Preferred Alternative by the increased energy required for additional train service. Overall, the TSM would reduce energy consumption by 177 billion British Thermal Units, or BTUs (BTUs are a measure of energy used to compare consumption of energy from different sources, such as gasoline, electricity, etc., taking into account how efficiently those sources are converted to energy). The Preferred Alternative would reduce energy consumption by 151 billion BTUs.

UTILITIES AND SUBSURFACE STRUCTURES

The Preferred Alternative would require relocation and/or protection of numerous utilities along its tunnel alignment approach to GCT and in Queens at Northern Boulevard and in Sunnyside Yard. Option 1 of the Preferred Alternative, which would be closer to the surface in the GCT approach, would require more utility work than Option 2. In Sunnyside, a 42-inch sewer near the

Honeywell Street bridge in Sunnyside Yard would be relocated. Physical conflicts between the new facilities proposed by the Preferred Alternative and existing utilities would be determined at a later date when the design of these facilities is further advanced. To ensure that no significant adverse impacts occur to the existing utility infrastructure in the area of project construction, a utility relocation report is being prepared by the project designers. A detailed field survey is being conducted along the entire alignment of the Preferred Alternative, and all relevant agencies, utilities, and property owners are being contacted. The purpose of this survey is to locate all visible utility street appurtenances (e.g., manholes, hydrants, etc.) and related features, and to document topographic features of the alignment.

CONTAMINATED MATERIALS

The Preferred Alternative raises potential issues related to contamination in locations where construction activities would disturb soil or groundwater. Most of the sites are in industrial areas, where contamination may have occurred from past uses on the sites themselves or from neighboring properties. To avoid potential impacts during construction, prior to any work at any of the project sites, Health and Safety Plans (HASPs) would be created to provide guidance related to hazardous materials or chemicals that may be encountered in project construction areas. After the design of project elements is more fully developed and prior to the start of construction, additional soil and groundwater sampling would be undertaken in all project construction areas where contaminated materials were identified. This additional work would be designed to characterize the nature, approximate quantity, and extent of contaminated materials at all construction areas. This would be undertaken to address worker safety and to identify any soil or groundwater that would require special off-site disposal.

In Manhattan, work in the below-grade portions of GCT and for hard rock tunneling would be predominantly in bedrock, and little soil would be encountered during construction. Since bedrock in Manhattan is relatively unfractured and impervious, the potential for the downward migration of water or other liquids that may transport contaminants into the bedrock is reduced.

Each of the potential yard locations in the Bronx and Queens are located in industrial areas and either are currently or have been, active rail facilities since the early 1900's. Contamination levels identified in the investigation of these sites are typical of those found in industrial urban areas and do not pose an unusual or significant threat to the environment. The HASPs created for these sites would minimize potential risks associated with contaminated materials and identify methods of handling fuel tanks or buried drums in the event they are encountered.

Sunnyside Yard is listed as a Class II Inactive Hazardous Waste Site by the New York State Department of Environmental Conservation (NYSDEC) and has had widespread contamination from petroleum and PCBs. Previous subsurface investigations have established the presence of an approximately 200,000-gallon plume of PCB-contaminated oil floating in the groundwater approximately 2 to 7 feet beneath Sunnyside Yard. This plume is in the northeast portion of the yard, near Northern Boulevard and 38th Avenue. For this reason, special care would be taken at Sunnyside Yard, including ongoing coordination with Amtrak and NYSDEC, to ensure that the project would not interfere with any remediation efforts at the yard. Soil and groundwater would be removed from Yard A, tested, and disposed of properly. The excavation area would then be enclosed with virtually watertight walls constructed using slurry and jet grout, protecting construction activities from contaminated groundwater beneath the yard and minimizing the amount of dewatering required. A conservative model of groundwater conditions in the yard has concluded that with this construction technique, the plume would not be expected to move by more than 3 feet. Nonetheless, during construction activities in Yard A, the plume would be monitored for movement. In addition to using special construction techniques at Yard A, the project would construct tunnels deep beneath Sunnyside Yard to avoid affecting contaminated areas in any way.

Based on groundwater sampling performed to date, all groundwater (other than the PCB-contaminated plume at Sunnyside/Yard A) could be pumped to sewers without further treatment. The construction specifications for dewatering would include testing to ensure that regulatory levels are not exceeded. Settling basins may be required at Yard A to reduce levels of suspended metals. At Highbridge, the only site where discharge to surface water is feasible, sampling results indicate that, if necessary, groundwater could be pumped to the Harlem River without treatment. If dewatering to the river is necessary at Highbridge, a testing program and site-specific discharge limits would be developed with NYSDEC.

NATURAL RESOURCES

The Preferred Alternative would not affect freshwater wetlands, unique habitats, or threatened and endangered species, as none were identified in the project study areas. The Preferred Alternative would not require construction in water bodies, navigable or otherwise. Portions of Yard A, Sunnyside, Blissville, and Highbridge Yards are located within the 100- or 500-year floodplain. Any habitable structures would be located outside the 100-year floodplain, flood-proofed, or raised above the 100-year floodplain. The Preferred Alternative would not constitute a floodplain encroachment.

Water quality issues are primarily related to the quality of water discharged to the city sewers as a result of dewatering activities, except at Highbridge which is directly adjacent to the Harlem River. An industrial discharge evaluation would be made for potential waste streams generated at Highbridge Yard such as those from storage and maintenance facilities, train car wash systems, train car sanitary waste removal operations, fueling pad area storm water and other industrial-related discharges. Pre-treatment systems would be designed and specified to meet industrial discharge limits as administered by the New York City Department of Environmental Protection (NYCDEP). The existing storm drainage systems at the yard would be evaluated for condition, regulatory compliance, and capacity. The systems would be rehabilitated or replaced, as required. Controls would be implemented during construction activities to prevent soil erosion and runoff of sediment, silt, and other contaminants into the river.

The Preferred Alternative is consistent with the city and state policies of the Waterfront Revitalization Program, New York City's coastal zone management program.

CONSTRUCTION IMPACTS

Since the No Action Alternative would not require new construction, no construction-related impacts would occur. The TSM Alternative would result in some disruption, but this would be relatively minor compared to the work required for the Preferred Alternative. The construction work related to the TSM Alternative would result in some noise, dust, and disruption near the Hunterspoint Avenue LIRR station and the affected portion of the LIE.

Construction of the Preferred Alternative would result in disruptions and inconveniences in areas near the construction sites. Considering the size and scope of the project, however, the disruption would be quite limited. Most of the work would occur either underground, with limited or no activity at the surface or in public areas, or in railroad yards that are separated from surrounding uses. Disruptions would occur near GCT in Manhattan, and near Northern Boulevard and Barnett Avenue in Queens.

In Manhattan, most of the work with either option would be related to the construction of the new tunnels deep beneath the surface. This work would not be perceptible at the surface, except for some possible ground-borne noise during the few weeks of construction directly under some buildings. In addition, both options would use the existing 63rd Street Tunnel and a staging area in Queens to access the tunnels, which would eliminate much of the trucking activity typically associated with tunnel construction such as muck removal and material and equipment delivery. The major effects associated with construction are outlined below.

Due to its shallower depth, Option 1 would result in much more disruption at the street level than Option 2. Under Option 1, extensive cut-and-cover work would be required along 52nd, 53rd, and 54th Streets between Park and Madison Avenues and 54th Street between Park and Lexington Avenues. These streets are predominantly commercial, but do include some residential and hotel uses. The disturbances would be limited as much as possible through the use of traffic maintenance plans. The anticipated sources of disturbance would include dust, noise, and vibration during surface excavation; storage and handling of construction materials; and temporary reductions in sidewalk width, traffic lanes, and curbside parking. The construction work at these locations would last several years.

Option 1 would also require the underpinning of four buildings along the west side of Park Avenue—Lever House (390 Park Avenue), the Racquet & Tennis Club (370 Park Avenue), 400 Park Avenue, and 410 Park Avenue. The work would involve the temporary use of a portion of each basement for a period of up to two years. In addition to the displacement of the current users of each space and the general disruptive nature of construction work, the most noticeable effect would be noise and vibration during excavation of rock below the current basements. The excavation work could take up to six months at Lever House and the Racquet & Tennis Club, while 410 and 400 Park Avenue would require less time. This would most likely be accomplished by controlled blasting. While the effect would be of very short duration (4 to 5 seconds a few times a day), they may be disconcerting to some building occupants. At these locations, with primarily daytime uses, all efforts would be made to schedule the blasting during non-work hours.

Option 1 would also require significant work that would affect Metro-North Railroad operations. Work in the lower level of GCT would involve the relocation, underpinning, or removal of existing structural columns that would require track and platform outages on the upper level. In addition, the underpinning of the four buildings on Park Avenue and the construction of the new LIRR tunnel under the MNR structure between 54th and 56th Streets would require closing of some MNR tracks in this area. During the peak period, up to two tracks would be out of service continuously and at the same time. During off-peak hours and weekends, up to three tracks would be out of service at one time. While the construction activities would be performed without reducing future planned service levels on Harlem, Hudson, and New Haven lines, they would nevertheless temporarily adversely impact MNR service. Schedule resiliency, or the ability of the system to absorb delay, and the recoverability of the railroad in the event of equipment failure or another operational incident would be adversely affected for as long as the track outages are required. Measures to minimize prolonged service disruptions resulting from track outages would include reducing the number of tracks taken out of service during the peak periods and sequencing track outages to maximize the efficient completion of construction tasks. The optimal solution would be determined through the use of a simulation model to test the effects of delays and equipment failures under a variety of track outages.

With Option 2, most of the above adverse effects could be avoided. Because this option would be deeper than Option 1, no underpinning would be required either for MNR tracks or the four Park Avenue buildings. In addition, the required structural work in the lower level of GCT would either not be necessary or at least be much less extensive than in Option 1. This would eliminate the impact to MNR operations and the buildings along Park Avenue. In addition, Option 2 would only require extensive cut-and-cover construction at one location: 55th Street between Park and Madison Avenues.

Construction work for new entrances would be essentially the same for either option, including the work at 47 East 44th Street. However, this work would be similar to other similar sized construction projects in NYC and would not be considered overly disruptive.

Most of the work along the Queens alignment and in the railroad yard complex would be buffered from surrounding uses. Construction activities on either side of Northern Boulevard at 41st Avenue would in effect continue the construction activities that have been ongoing there for the 63rd Street Connector Project. The construction site being used for that project would also be used for the Preferred Alternative. This would cause some disruption (principally noise) at the Long Island City High School at 28-01 41st Avenue, adjacent to the site. Efforts would be made to work with the community to safeguard against complaints about dust, noise, traffic, and aesthetics during construction of the Preferred Alternative.

Construction of the Preferred Alternative across Northern Boulevard would result in some disruption to the subway lines (E and F) under the roadway. Over an approximately three-month period, followed by another two-month period six months later, up to two tracks would need to be taken out of service at night and over the weekend. This would result in some inconvenience to NYCT customers requiring additional transfers and backtracking to access some local stops.

At the Harold Interlocking between 43rd and 48th Streets, just east of Sunnyside Yard, the Preferred Alternative might require acquisition of private property along the north side of Barnett Avenue. If this occurs, the project would demolish the structures along the north side of Barnett Avenue to use the land as a construction staging area for the improvements at the interlocking. During construction, a temporary visual/noise barrier would be erected to protect residences across Barnett Avenue from construction of the viaduct, which should last approximately one year. After construction, the demolished structures may be rebuilt, depending upon the agreements made with the owners prior to construction.

The construction activities proposed at Blissville or Maspeth Yard, Fresh Pond Yard, and Highbridge Yard are relatively minor. It is not expected that the work at these locations would result in any significant adverse effects during construction.

The public expenditure required for the Preferred Alternative would translate directly into jobs associated with construction labor itself, as well as services and materials. In addition to these jobs, the project would also result in indirect or secondary economic benefits, representing secondary-level expenditures by material suppliers, construction workers, and other employees involved with the project. Implementation of the Preferred Alternative would generate significant economic activity throughout its construction period.

ENVIRONMENTAL JUSTICE

As a project that would use federal funds, the East Side Access Project must comply with Executive Order 12898, "Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations." This Executive Order is designed to ensure that each federal agency "shall make achieving environmental justice part of its mission by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations." Executive Order 12898 also requires federal agencies to work to ensure greater public participation in the decision-making process. To this end, the East Side Access Project has an extensive public participation and community outreach program.

Overall, the impacts of the Preferred Alternative that could not be fully mitigated would not be disproportionate. While impacts would occur in some locations with concentrations of low-income and minority residents, similar impacts would occur in other locations with populations without those concentrations. Furthermore, the project would provide substantial benefits that would affect the same broad range of people that would experience the project's impacts. The project would also result in decreases in vehicle miles traveled, and associated decreases in air pollutants, throughout the LITC as well as in the Bronx. On balance, the significant unmitigated impacts of the Preferred Alternative would not disproportionately affect low-income or minority populations.

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Chapter 1: Project Purpose and Need

A. INTRODUCTION

The Federal Transit Administration (FTA) and the Metropolitan Transportation Authority (MTA), in cooperation with the Long Island Rail Road (LIRR), propose the East Side Access Project, to provide direct access for LIRR riders to Grand Central Terminal (GCT) at Park Avenue and 42nd Street. The proposed project is the locally preferred alternative, recommended after careful consideration of a full range of alternatives in the Major Investment Study (MIS) for the Long Island Transportation Corridor (LITC), which was completed in April 1998.

This chapter discusses the need for the proposed East Side Access Project. The following sections identify the project, define the current and future travel problems in the LITC, describe the project's background and current planning context, present the project's goals, and outline the review and approval process for the project. These discussions summarize the work of the project's MIS as updated with the results of the EIS analyses.

B. IDENTIFICATION OF THE PROPOSED ACTION

As shown in Figures 1-1 and 1-2, the proposed action would bring passengers to GCT by constructing connections from the LIRR Main Line and Port Washington tracks south of Sunnyside Yard (in Queens) to the lower level of the existing 63rd Street Tunnel under the East River and from there to GCT. The new connecting tunnel in Queens would pass beneath Long Island City at approximately 41st Avenue; in Manhattan, the connecting tunnel would curve southward from the existing tunnel at 63rd Street and approximately Second Avenue toward Park Avenue, where it would continue to GCT.

The proposed action also offers the opportunity to create a new station to serve customers at Sunnyside and Long Island City, Queens. This station, adjacent to Sunnyside Yard near Queens Boulevard, would offer LIRR service to Penn Station. The station would also be constructed to permit future expansion for possible use by Amtrak and/or New Jersey Transit (NJ Transit) trains.

This Draft Environmental Impact Statement (DEIS) considers the potential impacts of the East Side Access Project in the LITC, which is broadly defined to encompass the majority of origins, destinations, and routes of those traveling between Long Island and New York City. It therefore consists of Manhattan, Queens and Brooklyn, and Nassau and Suffolk Counties.

The proposed action is critical for the future of the LITC. Without the project, transportation conditions in the corridor will deteriorate:

- The LIRR will not be able to accommodate demand for service into Manhattan, causing severe overcrowding on peak hour trains.

- Commutes on the LIRR characterized by crowding and delays will continue to be followed by time-consuming trips to East Midtown by many LIRR commuters, causing millions of person-hours of delay each year.
- Inadequate transit service will worsen already serious congestion on the region's roads and highways, as residents of Long Island and eastern Queens choose to drive to avoid the growing inconvenience of mass transit.
- Commuters in aggregate will travel hundreds of thousands of miles in automobiles, worsening already poor air quality conditions.

C. PROBLEM IDENTIFICATION

The New York Metropolitan Area is the most transit dependent region in the United States. According to 1990 Census journey-to-work data, some 2 million people travel to and from work in Manhattan each day, and the great majority arrive by public transportation: approximately 58 percent take subways or buses and 13 percent commute by rail from the suburbs. However, the transit/rail system, by far the largest in the nation, is more than 70 years old. It has not expanded at the rate of the region's population and employment, and its routes and terminals do not fully meet the needs of those it serves. These problems extend beyond mere travel inconvenience and potentially threaten the region's environment, economy, and character. The discussion below describes the regional transportation network and focuses on the LITC and its problems.

EXISTING REGIONAL TRANSPORTATION NETWORK

The 31-county New York-Connecticut-New Jersey Metropolitan region contains a vast network of transportation services. The oldest components of the network are the regional rail and transit systems, built to transport passengers and freight throughout the area and beyond. Today, the passenger rail system serves mostly commuters traveling to and from the Central Business District (CBD) in Manhattan. The largest component of the commuter rail and transit network is the MTA system, which serves commuters from suburban counties in New York State and Connecticut and within New York City.

The regional highway system serves local, regional, and national vehicular traffic, moving freight, long-distance travelers, commuters, and local trip-makers. The regional roadways are linked to the island of Manhattan via 16 bridges and 4 tunnels. Within Manhattan, the vast majority of surface roads are local streets.

Beginning in the early 17th century, from the foot of what now is Old Fulton Street in Brooklyn to the Wall Street area, Manhattan's location adjacent to New York Harbor has fostered a long tradition of ferry service. Today, there are a number of ferry options for commuters, from Staten Island, across the East River, and across the Hudson River. Regional network components are described in more detail below and shown in Figure 1-3.

TRANSIT CONNECTIONS FROM NORTH AND EAST

Commuters coming into the CBD from the north and east, in Westchester, Putnam, and Dutchess Counties, southwestern Connecticut, Upper Manhattan, the Bronx, Long Island, Queens, and Brooklyn, rely most heavily on the MTA's five types of transit service—LIRR, MNR, New York City Transit (NYCT) subway, NYCT bus, and Long Island Bus (LI Bus)—to get to their jobs. These five MTA providers carry more than 1.9 billion riders each year, or more

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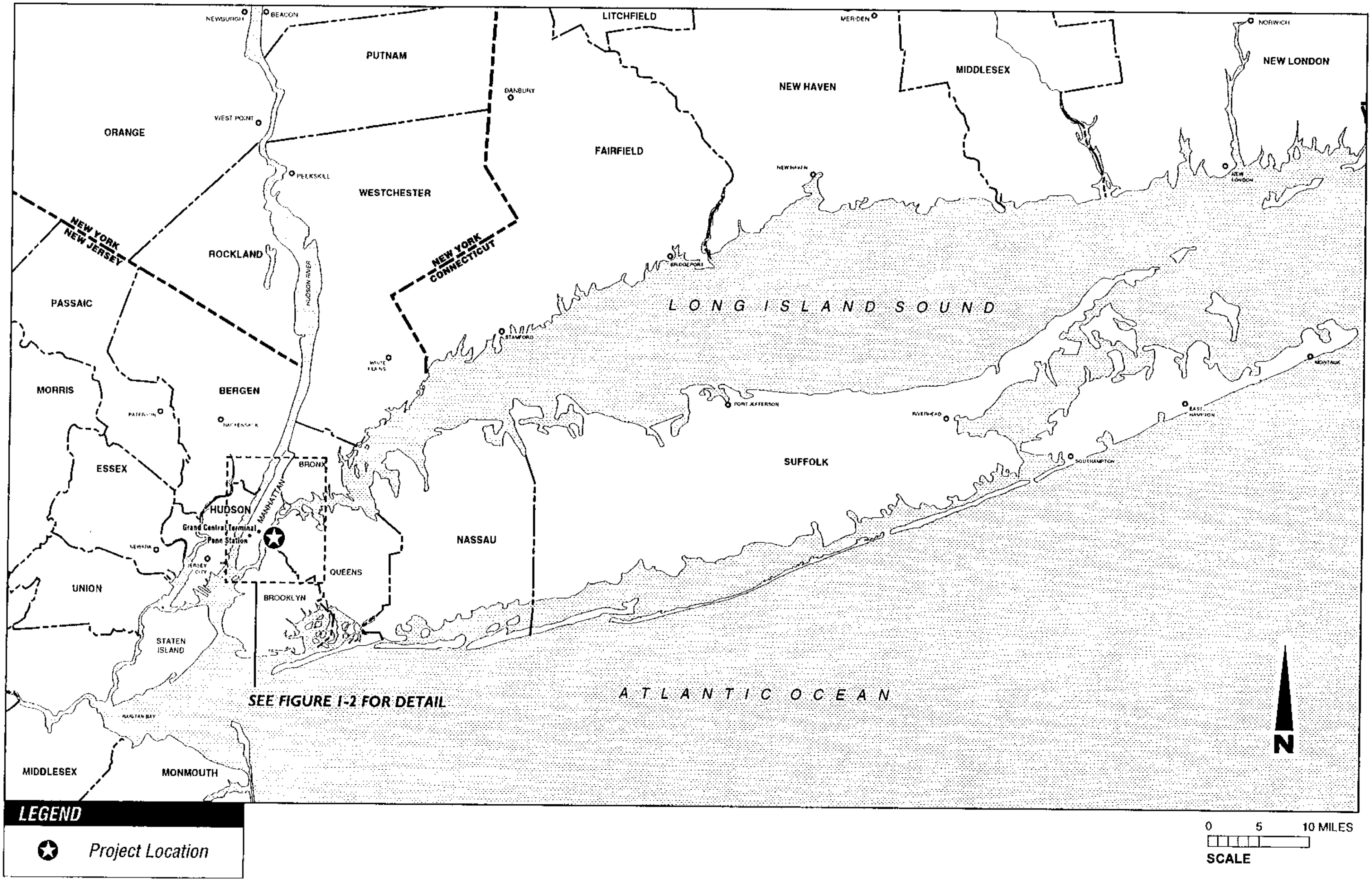
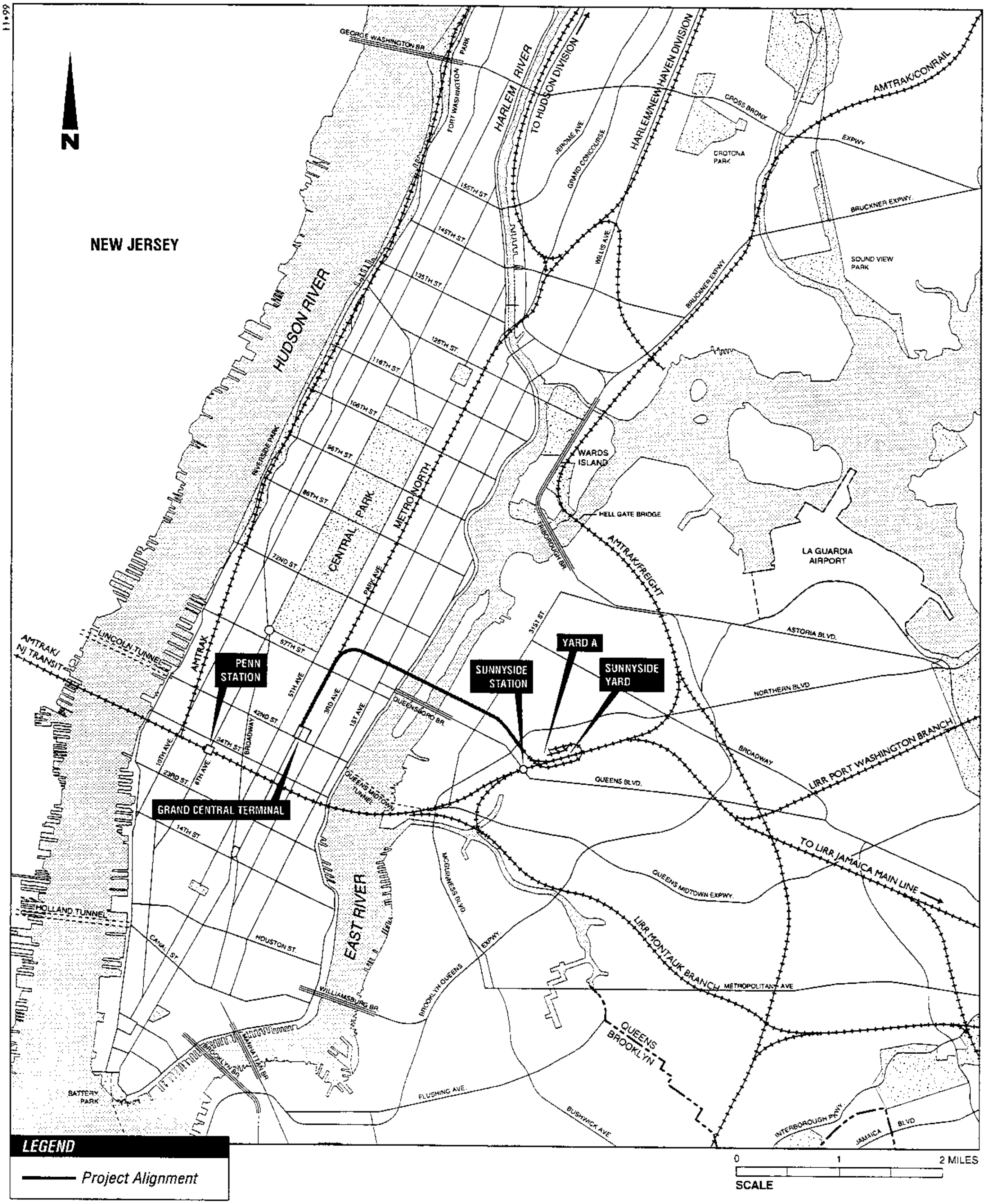


Figure 1-1

Project Location



MTA / LIRR
East Side Access

Figure 1-2

Location of Preferred Alternative

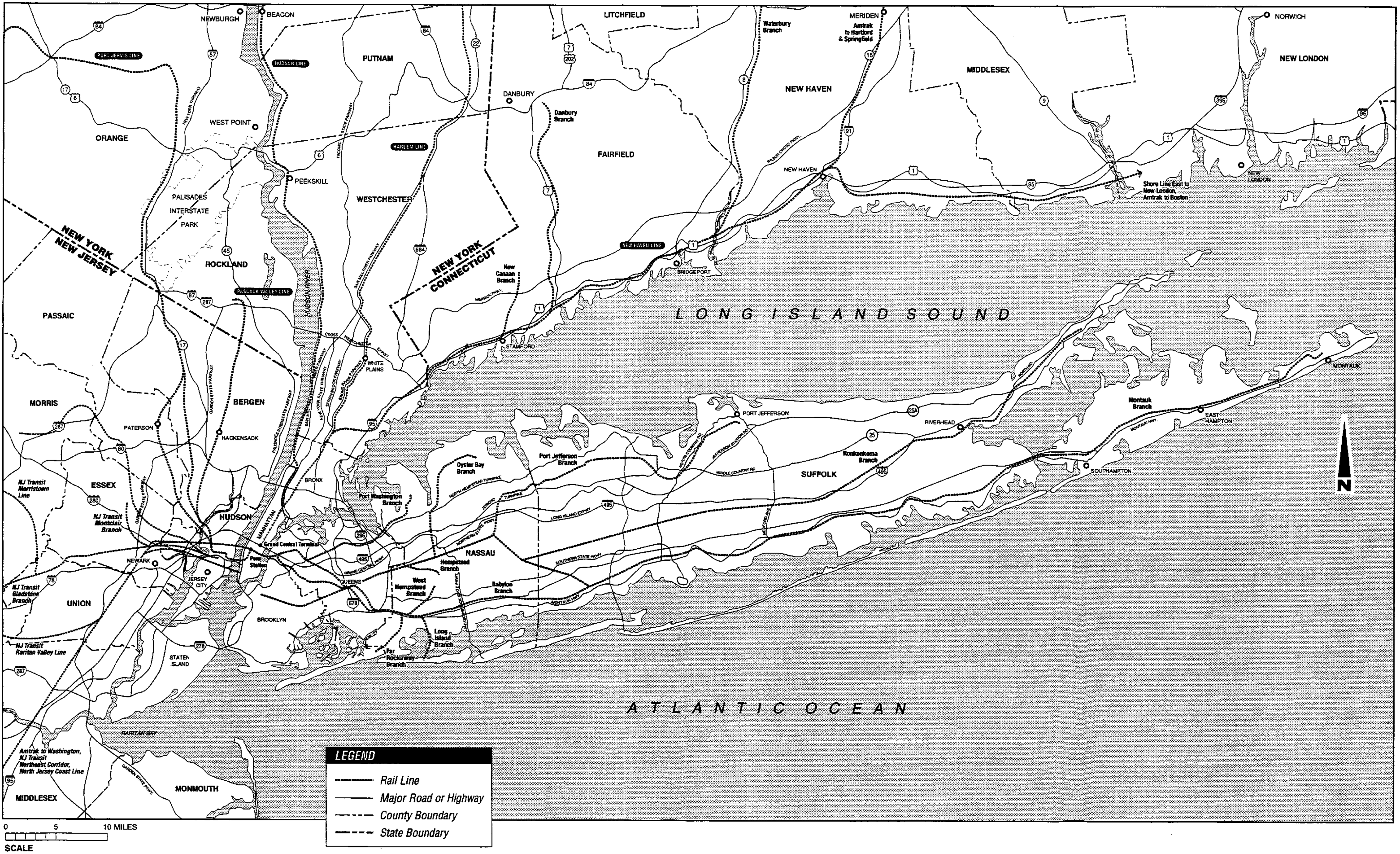


Figure 1-3
Regional Transportation Network

than 6.0 million riders each weekday, accounting for nearly two out of every three rapid transit trips and half of all commuter rail trips in the nation.

MNR brings more than 70,000 passengers into GCT each weekday morning during the peak period (6 to 10 AM). Serving Manhattan, Bronx, Westchester, Dutchess, and Putnam Counties, and Connecticut (as well as Rockland and Orange Counties in cooperation with NJ Transit), MNR is the second largest commuter rail system in the United States, carrying 62.9 million passengers in 1996 over 340 route miles serving 120 stations. MNR is currently the sole railroad user of GCT. All MNR trains serving areas east of the Hudson River operate on three lines—the Hudson, the Harlem, and the New Haven—that cross the Harlem River to enter Manhattan, and then travel south on a viaduct above Park Avenue to 96th Street. From 96th Street, the tracks run beneath Park Avenue to GCT. At GCT, the tracks fan out and separate into two levels. The westernmost tracks of the lower level serve as MNR's Madison Yard, used for midday storage and maintenance. Most other MNR tracks serve trains carrying passengers into the terminal.

TRANSIT CONNECTIONS FROM WEST OF THE HUDSON

Commuters coming into Manhattan from west of the Hudson River rely heavily on NJ Transit trains, the Port Authority Trans-Hudson (PATH) train, Amtrak trains, Hudson River ferries, and a number of buses operated by NJ Transit and private carriers. NJ Transit also operates service for MNR on the New York portion of the Pascack Valley and Port Jervis lines. While ferries operate into two primary piers on the west side of Manhattan—at 38th Street and at Battery Park City—all other public transportation into Manhattan from New Jersey is funneled through or over seven river crossings: the George Washington Bridge, Lincoln Tunnel, and Holland Tunnel, which carry buses; the rail tunnel that carries NJ Transit and Amtrak trains to and from Penn Station; and two PATH tunnels, which carry commuters from Newark, Jersey City, and Hoboken, including those who have transferred from NJ Transit trains. Many of the commuter buses use the Exclusive Bus Lane on Route 495 to make direct connections to the Lincoln Tunnel and the Port Authority Bus Terminal.

NJ Transit has traditionally run trains from two of its three Newark Division lines—Northeast Corridor and North Jersey Coast—directly into Penn Station (commuters on the Raritan Valley line transfer at Newark for these trains). Commuters on Hoboken lines—the Morris and Essex line, Main line, Bergen line, Pascack Valley line, and Port Jervis line—were routed to Hoboken, where they transferred to PATH or ferry service. In June 1996, NJ Transit initiated Midtown Direct service, which gave select trains from its Morris and Essex line a one-seat ride into Penn Station. (See "Current Planning Context" below for more information about NJ Transit projects related to Penn Station.)

Amtrak's Northeast Corridor line, which runs from Washington, D.C., in the south to Boston in the north, uses Penn Station as its only stop in New York City. Each year, approximately 38 percent of Amtrak's total national riders begin or end their trips in Penn Station, New York. Numerous commuters use Amtrak's service between Philadelphia and New York to make their daily commutes.

THE REGIONAL HIGHWAY NETWORK

In addition to the public transit system described above, a dense network of heavily used highways, local roads, and bridges bring almost 900,000 people into Manhattan each day, via 20 river crossings. Major interstate highways and state/local parkways form the network of regional roads that brings commuters to Manhattan. The New Jersey Turnpike, Garden State Parkway, Palisades Parkway, and the New York Thruway (I-87) are major north-south highways west of the Hudson River; these either connect to east-west feeders, which bring vehicles to the Holland and Lincoln Tunnels and the George Washington Bridge, or, in the case of the Thruway, bring travelers directly over the Hudson (on the Tappan Zee Bridge).

From the north and northeast, the Henry Hudson Parkway, the Hutchinson River Parkway, the New York Thruway, Broadway (U.S. Route 9), and the New England Thruway (I-95) funnel vehicles across the Harlem and East Rivers into Manhattan. Bringing travelers from Long Island, the Long Island Expressway and Grand Central Parkway (which becomes the Northern State Parkway farther east) end at the Queens-Midtown tunnel and Triborough Bridge, respectively. Queens Boulevard (Route 25 farther east) terminates at the Queensboro Bridge, the most heavily traveled East River crossing. This bridge also receives traffic flows from the Brooklyn-Queens Expressway, which links the Grand Central Parkway to Brooklyn and points south. Long Island's highways also feed into Manhattan via the Belt Parkway to the Brooklyn-Battery Tunnel or to the Brooklyn-Queens Expressway and then to any one of three Brooklyn-to-Manhattan East River Bridges (Brooklyn, Manhattan, Williamsburg).

LONG ISLAND TRANSPORTATION CORRIDOR

Employed residents living in the LITC make up approximately 40 percent of the metropolitan area's total employed population who work outside the home (trip-based labor force). According to the New York Metropolitan Transportation Council (NYMTC), more than 440,000 commuters travel from homes in Queens, Nassau, and Suffolk Counties to jobs in Manhattan each day. They do so using four primary modes of travel: LIRR, NYCT subways, NYCT and LI buses, and automobiles. The following sections provide a brief discussion of each of these modes of travel: how they came about, the areas they cover, and whom they serve.

LONG ISLAND RAIL ROAD

The LIRR was originally constructed to shorten travel time to Boston; passengers traveled through the center of the Island to Greenport, boarded a ferry to Stonington, Connecticut, and continued via train to Boston. Its first train ran on April 18, 1836, and the majority of its current track system was built between the 1830's and 1900. The construction of the LIRR's 10 branches—along with its connection directly into Penn Station through two East River tunnels in 1910—played a major role in shaping development on Long Island, by significantly cutting travel times into Manhattan.

The LIRR is the busiest commuter railroad in North America, with an average total daily ridership of 269,400 passenger trips on 740 trains each weekday and a total annual ridership of 80.3 million passengers in 1998. Its 10 branches consist of 365 route miles and 124 stations, serving the area from Montauk and Greenport on eastern Long Island's South and North Forks, to its primary western terminal: Penn Station in Manhattan, approximately 120 miles away (see Figure 1-4). All branches except Port Washington run through Jamaica Station, where passengers on some non-dual mode diesel trains switch to electric trains for the ride to Penn Station.

Each weekday morning, some 103,000 riders arrive at three western terminals during the peak period: Penn Station, Hunterspoint Avenue/Long Island City (in Queens), and Flatbush Avenue (in Brooklyn). Nearly 90,000 of these passengers, or 87 percent, are destined for Penn Station. Of the remaining passengers destined for one of the western terminals, 2 percent (2,350) disembark at Hunterspoint Avenue/Long Island City in Queens and 11 percent (11,000) at Flatbush Avenue in Brooklyn. Jamaica Station, which is not one of the western terminals, is actually the

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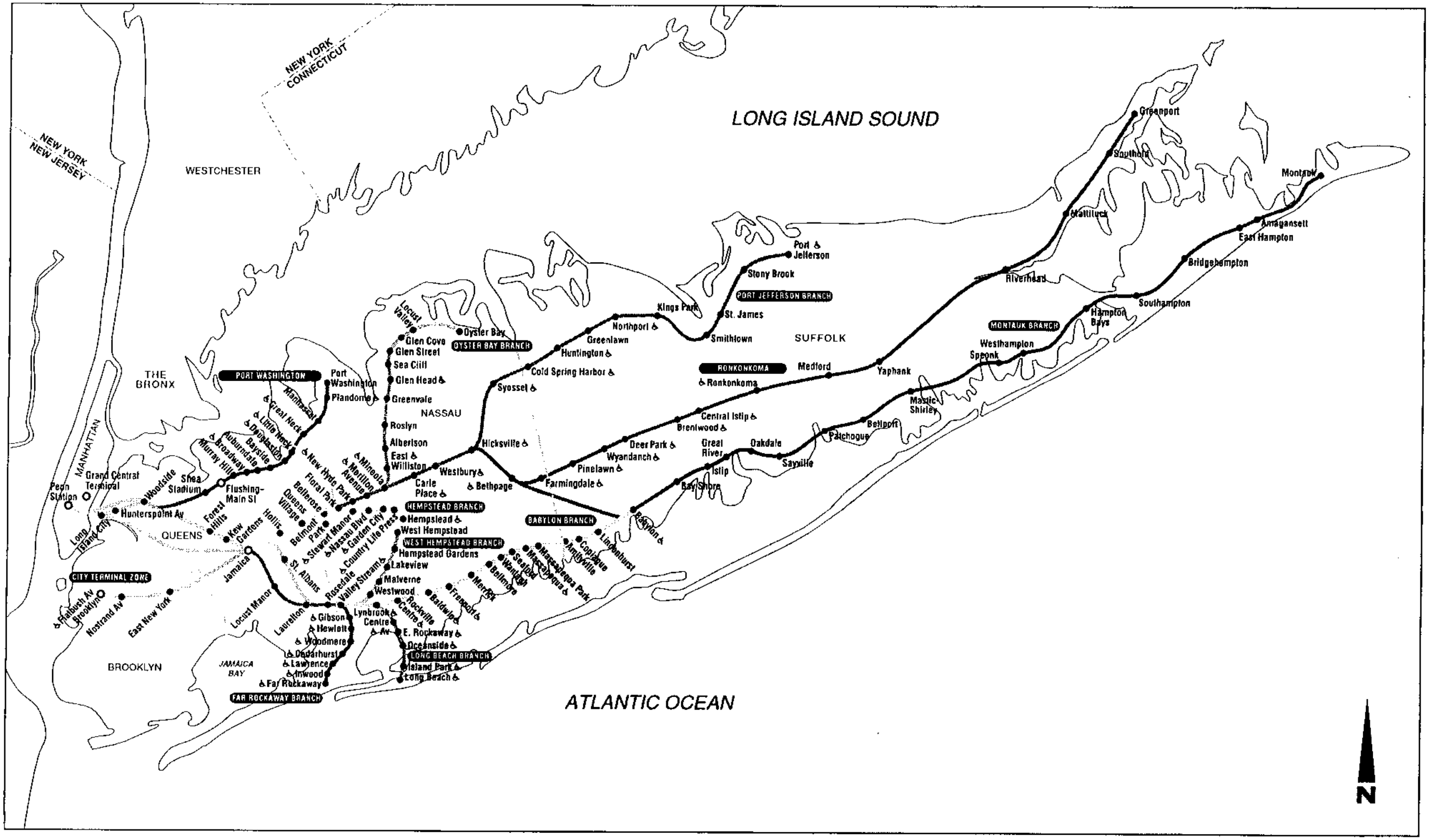

Figure 1-4

Long Island Rail Road Map

third most popular disembarkation spot for LIRR commuters, with more than 3,500 passengers getting off trains during the AM peak period. The vast majority of LIRR's morning riders board at stations in Nassau and Suffolk Counties, and nearly three-quarters use one of four branches: Babylon, Port Jefferson, Port Washington, or Ronkonkoma (see Table 1-1).

Table 1-1
Morning Peak Commuting by LIRR Branch, 1998
East of Jamaica

Branch	AM Peak Weekday Boarding Passengers	Percent of All AM Peak Boarding Passengers
Babylon Branch	28,840	27%
Port Jefferson Branch	19,860	19%
Ronkonkoma Branch	17,970	17%
Port Washington Branch	16,570	15%
Long Beach Branch	8,730	8%
Hempstead Branch	4,910	5%
Far Rockaway Branch	4,560	4%
Montauk Branch	2,260	2%
Oyster Bay Branch	1,800	2%
West Hempstead Branch	1,720	2%
TOTAL	**107,220**	**100%**

Source: MTA Long Island Rail Road, *Long Island Rail Road Fall 1998 Ridership*.

In addition to commuters from Long Island, the LIRR serves patrons who live in eastern Queens. In addition to the terminals at Long Island City and Hunterspoint Avenue and the major transfer point at Jamaica, the LIRR makes 18 stops in Queens on four different branches—the Port Washington branch, the Hempstead branch, the West Hempstead branch, and the Far Rockaway branch—and in the City Terminal zone west of Jamaica. On the Port Washington branch during the AM peak period, riders who board at stations in Queens represent more than half (52 percent) of the total ridership on that branch.

All LIRR trains bound for Manhattan travel on the Main Line alongside Sunnyside Yard in Queens to the East River tunnels at Long Island City/East 33rd Street. Adjacent to Sunnyside Yard, LIRR trains and Amtrak's Northeast Corridor trains traveling to and from Penn Station share the Harold Interlocking, an approximately 1.5-mile-long portion of track leading to the East River tunnels. The Harold Interlocking allows connection among tunnel tracks, LIRR's Main Line tracks, Amtrak's Northeast Corridor tracks through Queens and over the Hell Gate Bridge, and loop tracks leading into and out of the yard. Amtrak also uses Sunnyside Yard for train maintenance and storage, and NJ Transit stores trains there during the midday as well. Amtrak and NJ Transit can access storage and maintenance facilities via the loop tracks, without using Harold Interlocking. Just north of Sunnyside Yard is Yard A, which is used by New York & Atlantic Railway (NYAR) for freight operations.

NEW YORK CITY TRANSIT BUSES AND SUBWAYS

NYCT serves more than 1.8 billion riders annually over 1,671 bus-route miles and approximately 244 train route miles. Bus and subway service between Manhattan and Queens centers around the No. 7 Flushing Line and the Queens Boulevard (E, F, and R) lines (see Figure 1-3). Both of these lines are linked by feeder bus service to Eastern Queens and Nassau County. These four subway lines bring approximately 85,000 commuters into Manhattan in the peak AM hour (and are all filled to at least 80 percent of capacity). The N train brings another 13,620 commuters in the AM peak hour from Astoria and Long Island City.

While most Queens subway lines parallel LIRR lines, competition between the two transit providers is minimal, with the subway serving predominantly city dwellers and the LIRR serving predominantly residents of Nassau and Suffolk Counties. The proximity of the two service providers does, however, provide a number of transfer sites from LIRR to subway and vice versa, the most popular of which are at Flatbush Avenue in Brooklyn (2, 3, 4, 5, B, D, Q, M, N, and R subway connections), Jamaica in Queens (E, J, and Z subway connections) and Woodside and Hunterspoint Avenue in Queens (7 train connection). LIRR passengers use these subway connections to travel to and from destinations on Manhattan's East Side and in Lower Manhattan, and in Brooklyn and Queens.

EXPRESS BUS SERVICES/LONG ISLAND BUS SERVICES

Thirty-five express bus lines, operated by the New York City Department of Transportation (NYCDOT) and NYCT, run between Queens and Manhattan, serving outlying neighborhoods in Queens and Western Nassau County. The MTA operates 53 LI Bus routes serving almost 100 communities in Nassau and Suffolk Counties and eastern Queens. Many Nassau County residents take the bus to the No. 7 subway at Main Street, Flushing, and the E and F lines at Jamaica. LI Bus routes also connect to 47 different LIRR stations.

EAST RIVER FERRIES

East River ferry routes, initiated in the past decade by New York Waterway, provide ferry service between Long Island City and East 34th Street in Manhattan every 15 minutes during peak morning and evening hours and between the Marine Air Terminal at La Guardia Airport and 62nd Street, 34th Street, and Wall Street every hour from 7:45 AM to 5:45 PM. New York Waterway ferry service is combined with free shuttle bus service to and from various Manhattan destinations. Use of commuter ferry service across the East River has traditionally been limited by the longer travel timer needed to access ferry landings.

HIGHWAYS AND BRIDGES

Since the 1920's, thousands of miles of interstate highways, expressways, and parkways have been constructed in the New York Metropolitan Area. Long Island is served by three primary east-west highways (Long Island Expressway, Northern State/Grand Central Parkway, Southern State/Belt Parkway), all of which are operating at capacity. These connect to 13 major north-south highways and parkways, which are also crowded during peak periods. Long Island's vehicular connection to the mainland is through 10 river crossings into New York City, seven of which connect to Manhattan over and under the East River.

Only three East River crossings—the Queens-Midtown Tunnel, the Queensboro Bridge, and the Triborough Bridge—are typically used by commuters to East Midtown. These crossings mark the termination of three major Long Island routes: the Long Island Expressway at the Midtown Tunnel, Queens Boulevard at the Queensboro Bridge, and the Grand Central Parkway at the Triborough Bridge. Once in Manhattan, commuters crossing these bridges are fed onto the streets of Midtown either directly (from the Midtown Tunnel and Queensboro Bridge), or onto Midtown streets via the FDR Drive or major avenues (from the Triborough Bridge).

STUDY AREA PROBLEMS AND NEEDS

INTRODUCTION

Manhattan is one of the largest and the most dense employment centers in the nation, set roughly in the center of a 31-county metropolitan region. It is also an island. Its economic and geographic position have made Manhattan's business districts particularly dependent on the regional transit system. The commuter rail services and subways are the most efficient in moving large numbers of people over sizable distances to a very dense center city with reliable and predictable travel time. The region's explosive growth during most of the 20th century, the shift in population outward into growing commuter suburbs, and the concentration of white-collar jobs that have remained in the city center have made the region's transit operations more vital to commutation and to the region's economy and environment, despite the rise of the automobile and its highway infrastructure.

In fact, although total employment in Manhattan has stayed essentially the same since the early 1970's, white-collar jobs have risen dramatically and consistently, while blue-collar jobs in industries such as manufacturing have declined. The 1,783,000 jobs in Manhattan in 1974 comprised 319,600 in manufacturing sectors and 628,230 in "office" sectors, such as finance, real estate, insurance, services; in 1998 Manhattan's employment totaled 1,767,899, with only 148,470 in manufacturing sectors and 818,286 in "office" sectors. As a result, Manhattan has experienced a tremendous growth in new office space in the post World War II period (nearly 213 million square feet), and East Midtown has seen most (62 percent) of that growth (nearly 132 million square feet). Along with this shift in employment type and location has come a concurrent shift in the residential location of the labor force. In particular, an increasing number of Manhattan workers are living in Nassau and Suffolk County suburbs and commuting to jobs in Manhattan.

Population, employment, and labor force projections prepared by NYMTC for New York City and Long Island for the years 2010 and 2020 indicate that these trends will continue. Employment in Manhattan is projected to increase 21 percent by 2020, and the size of the labor force in Nassau, Suffolk, and Queens is projected to increase 28 percent by 2020.* These trends indicate that demands on the currently overtaxed transit and traffic systems will increase significantly, as the number of morning commuters arriving during the peak 4-hour period is projected to increase by 28 percent at Penn Station and at GCT in the period between 1995 and 2020 (see Table 1-2).

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* Projections prepared by Urbanomics for NYMTC, February 23, 1996.

Table 1-2
AM Peak 4-Hour Commuter Rail Ridership Without the East Side Access Project: 1995, 2010, 2020

Terminal	1995 Arrivals	2010 Arrivals	Percent Change 1995-2010	2020 Arrivals	Percent Change 1995-2020
LIRR to Penn Station	86,630	103,856	20%	110,522	28%
MNR to GCT	70,169	84,164	20%	88,738	27%
Source: KPMG Peat Marwick, LLP.					

CAPACITY PROBLEMS AND NEEDS

The first problem faced by the LITC is one of capacity. Capacity refers to the physical ability of a transportation system, or any of its elements, to carry travelers from one point to another. The capacity is defined as the number of passengers or vehicles that can be accommodated by a train, train platform, train track and tunnel, stairwell, mezzanine, bus, sidewalk, or street's traffic lane (or the combination of any of these) during a specified time frame, such as an hour or part of an hour, a peak period (three or four hours, normally during the "rush hour"), a day, or a year. Volumes (the number of people or vehicles actually using a transportation facility) are compared to capacities (this is known as a volume-to-capacity; or "v/c" ratio) to determine severity of crowding on a transportation system.

LIRR Capacity Problems And Needs

Long Island's population and Manhattan's white-collar job base have both grown so substantially over the years that Penn Station is now operating, by all measures, at maximum capacity. The railroad's capacity at Penn Station is limited in several ways: by the capacity of the East River tunnels; by line haul capacity (the number of trains that can pass through the system, which is affected by the signal system and dwell times); by interlocking plant capacity at Penn Station (the interlocking plant is the system of track crossovers used by trains traveling toward the platforms); by platform capacity for passengers leaving trains, which in turn affects train dwell times; and by the storage capacity of the West Side Yard. Capacity limitations for pedestrians in the LIRR passenger concourses at Penn Station further limit the overall capacity at Penn Station.

The LIRR has attempted to address passenger overcrowding and train traffic at Penn Station by marketing subway connections from its other western terminals as time-saving alternative routes into East Midtown and Downtown Manhattan. As noted earlier, numerous passengers are making connections to the subway at LIRR stations in Queens (particularly Hunterspoint Avenue and Jamaica) and Brooklyn (Flatbush Avenue). At the three western terminals, most LIRR passengers continue on NYCT subway lines to final destinations in either East Midtown (connecting to the No. 7 train at Hunterspoint Avenue or Woodside) or Downtown Brooklyn and Lower Manhattan (connecting to the 2, 3, 4, 5, B, D, Q, M, N, and R trains at Flatbush Avenue). In addition, a number of passengers transfer from the LIRR to the E train at Jamaica Station in Queens, for destinations in East Midtown. But, as detailed in the East Side Access MIS, riders are deterred from using these subway connections to complete their trips because of the following "friction factors":

- The disincentive of a two-seat ride;
- Psychological resistance to changing modes;
- Perceived concerns about personal security on subway trains (especially outside of Manhattan);
- The added cost of an additional subway fare;
- Overcrowding on connecting subway lines;
- Perceived unreliability of subway service to suburban commuters;
- Lack of connectivity between certain LIRR routes and subway transfer spots; and
- Limited LIRR services connecting to subways.

The LIRR has also implemented a number of system improvements over the past few years that have improved capacity at Penn Station to 36 trains per hour. These include the 1987 construction of the West Side Rail Yard and the complete reconstruction of the LIRR passenger concourses (the Level "A" concourses) in Penn Station. Additional planned improvements are projected to improve capacity to, at best, 42 trains per hour. However, without additional tunnel and track creation, further capacity improvements are nearly impossible. Capacity of 42 trains per hour will not sufficiently meet the projected needs of LIRR customers.

Projections indicate that the number of LIRR commuters coming into Penn Station in 2020 is expected to increase 25 percent, to nearly 50,000 in the morning peak hour in 2020. This increase in ridership, combined with the inability to expand capacity, would result in severe crowding conditions on peak hour LIRR trains. In 2020, during the busiest time of day, LIRR trains are projected to be operating at 127 percent of capacity.

These ridership projections do not fully demonstrate the demand for service, however, as they are affected by the system's capacity constraints. Ridership forecasting for the East Side Access Project further demonstrates the need for additional LIRR service into Manhattan. The ridership forecasting model—which assumed 24 additional LIRR trains entering Manhattan (to GCT) in the AM peak hour—indicates that an additional 17,000 commuters would ride the LIRR into Manhattan in the AM peak period if such service were available (see Table 1-3; for more information, see Chapter 9, "Transportation").

Table 1-3

AM Peak 4-Hour LIRR Ridership
1995, 2010, 2020

Manhattan Arrivals	1995	2010 without East Side Access	2010 with East Side Access	2020 without East Side Access	2020 with East Side Access
Penn Station	86,630	103,856	58,154	110,522	62,249
GCT	0	0	62,334	0	65,676
Total	86,630	103,856	120,488	110,522	127,925

Source: KPMG Peat Marwick, LLP.

The movement of Amtrak's operations into the "New Pennsylvania Station" in the current Farley Post Office Building across Eighth Avenue from Penn Station (see description in "Current Planning Context" section below) will result in a substantial increase in passenger space above the tracks. However, it will only marginally increase needed platform availability and will not add to LIRR platform capacity or alter current tunnel capabilities.

The consequences of the projected growth in ridership combined with capacity constraints will be serious:

- LIRR platforms and Level "A" concourses in Penn Station will become even more crowded as more commuters embark on and disembark from a fixed number of trains.
- Crowding on LIRR trains will increase—trains will be standing-room-only during rush hours and inbound passengers not boarding at easternmost stations will rarely get seats. Trains that are currently standing-room-only will be unable to accommodate the demand for rides.
- Stations on Long Island will become increasingly crowded as more people wait to embark on the same number of trains.
- These conditions will result in lost riders—patrons will switch to autos, or even choose different locations to live or work—if no improvements are made.

Subway Capacity Problems And Needs

NYCT will soon open service from the Queens Boulevard line through the 63rd Street Tunnel to Manhattan (see further details in the "Current Planning Context" section), which will alleviate substantial existing and predicted overcrowding. However, this change to subway service will not make it easier for LIRR commuters to use the subway to get to destinations on Manhattan's East Side. It is clear that the subway—because it, too, operates at capacity—is not a long-term option as an alternative route for LIRR riders into Manhattan.

For instance, the Queens Boulevard lines (E, F and R) are severely overcrowded during rush hours. The Queens Boulevard lines are the second most heavily used in the system, with 1995 peak-point volume/capacity (v/c) ratios ranging from 1.22 (i.e, operating at 122 percent of capacity) on the F train to 0.98 on the E train. For comparison, a v/c ratio of about 0.35 would indicate that all seats in a subway car are taken, but nobody is standing.* V/C ratios of about 0.9 indicate unavoidable physical contact between riders, and v/c ratios above 1.0 indicate that most to virtually all riders are standing in direct physical contact with those around them with little to no room for movement. Beyond this v/c ratio, subway reliability can deteriorate as passengers require more time to board and disembark from the subway trains.

Highway Capacity Problems and Needs

While constructed as a response to growth in the city and its surroundings, the regional highway network has further encouraged the development of low-density, automobile-dependent suburbs characterized by single-family, detached houses. Not surprisingly, suburban development in counties such as Nassau and Suffolk on Long Island has quickly filled these highways and roads to capacity.

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* Due to their use in high-density, relatively short trip-length service, subway cars are not designed to maximize seating capacity, in contrast to commuter rail cars.

Long Island's highways face constant traffic problems, regardless of direction of travel, resulting in low travel speeds and stop-and-go driving conditions (see Table 1-4). According to the *Long Island Rail Road Network Strategy Study*, published by the MTA in May 1994, 52 percent of the state's total vehicle hours of delay occur on Long Island roadways. The Long Island Expressway is a good example: designed to carry a volume of 80,000 vehicles, it carries more than 180,000 vehicles each weekday. Mandated compliance with air quality standards (especially particulate and gaseous emissions standards) in the coming years will make expansion of the Long Island's highway system extremely difficult. And while current highway improvement projects (see "Current Planning Context" section below) may relieve some congestion situations on Long Island, they will not add capacity to East River crossings.

Table 1-4

AM Peak Hour Traffic Conditions

Highway Route	LOS at Peak Point*	Peak Hour Volume, Both Directions
Long Island Expressway at Grand Central Parkway[1]	F	13,840
Grand Central Parkway at Brooklyn-Queens Expressway[1]	F	10,640
Queens Blvd. at Queensboro Bridge and Northern Blvd.[2]	F	3,200

Note: * Level of Service (LOS) ratings range from A to F, with A indicating free flow traffic conditions and F indicating breakdown in vehicular flow.

Sources:

1 NYSDOT, Van Wyck Expressway/Western Queens ITS Project, Expanded Project Proposal Design Report, Eng-Wong, Taub & Associates, November 1998.

2 Traffic counts conducted by Eng-Wong, Taub & Associates, January 1999.

East River crossings form an effective bottleneck for vehicular traffic entering and leaving Manhattan, with most crossings (especially the three used as Midtown access points) experiencing extreme levels of congestion during peak hours. This was not always the case. In fact, while average daily traffic volumes at the Queensboro and Triborough Bridges and Queens-Midtown Tunnel more than doubled from 1948 to 1972, congestion limited volume increases to only 12 percent from 1972 to 1996, and peak hour crossing volumes have remained steady (and at capacity) in recent years (source: NYCDOT, *Manhattan River Crossings*, 1991, 1993, 1995, and 1996). As detailed in Chapter 9, "Transportation," traffic congestion impedes commuting into and out of Midtown Manhattan throughout the highway system on bridges and tunnels, on Manhattan streets, on Long Island highways, and on local bridge and highway feeder routes.

TRAVEL TIME PROBLEMS AND NEEDS

The second problem faced by the LITC is one of travel time. Travel time refers to the amount of time spent traveling from the trip's beginning ("origin") to its end ("destination"). Total trip time includes the time spent using each type ("mode") of transportation (e.g., walk, bus, subway, rail, auto, bicycle). Waiting, boarding, transfer, and alighting time are also included. Travel time is related to capacity and to accessibility. Where a system is congested (operating at or near capacity), travel time increases. In the case of rail systems, it takes passengers longer to get to and from platforms and to get on and off trains. As a consequence, the trains must stay longer in the station and some cannot meet their schedules, causing further back-up along the routes. In the case of vehicular traffic, bottlenecks at toll plazas, bridges and tunnels, along with accidents, cause back-ups farther down the road and even out to local streets, thus reducing local quality of life in addition to creating longer commute times.

Travel times for many LIRR commuters are further increased because of the distance between Penn Station or other LIRR terminals and the commuters' final destinations. Many commuters must transfer to one or two subways or bus lines to reach their workplaces on Manhattan's East Side. To avoid this inconvenience, some commuters opt to drive instead.

LIRR Travel Time

In some cases, excessive travel times in the corridor are a direct consequence of capacity constraints, but in the case of access to East Midtown, lengthened travel times are an issue of "disconnection." At the time Penn Station was constructed, the demand for rail travel was different from that of today. Before the nation's highway system and air travel were in place, long-distance travelers were major users of the LIRR. Penn Station, when it opened in 1910, was billed as the gateway to America. It boasted a grand main hall modeled after the Roman Baths of Caracalla, a separate arcade and ticketing hall, full baggage-check services and a 300,000-square-foot track area containing 27 tracks. In the mid-1960's the above-ground elements of the terminal were demolished and a new Penn Station was built, but the underground network of tracks and platforms remain the same. Today, although Amtrak provides long-distance travel, the overwhelming use of Penn Station is by commuters.

As the decades of the 20th century passed and commuters became a more important presence on the LIRR, the growth of white collar employment (generally the primary source of rail journey-to-work travel) centered on locations at some distance from Penn Station's location on Seventh Avenue and 34th Street. Key areas of commercial/office growth were Lower Manhattan and East Midtown, surrounding and north of GCT. There is now a considerable "disconnect" between the location of LIRR terminals, particularly Penn Station, and the location of jobs.

While LIRR trains enter Manhattan on the East Side through East River tunnels at 33rd Street, passengers cannot disembark until trains reach the West Side. Commuters who work in East Midtown, or at any location on the East Side, must double-back across town to reach their destinations. It is estimated that doubling-back costs commuters anywhere from 15 to 30 minutes of commuting time each way (for a total of 30 minutes to 1 hour each day). Since the train ride is typically 30 minutes to an hour, this in-Manhattan trip adds substantial time to the total trip. To avoid this doubling-back, other LIRR commuters transfer to subway connections in Queens to travel to destinations on the East Side or in Lower Manhattan. The additional LIRR travel time to East Midtown and the inconvenience of the transfer encourages some commuters to drive to work, adding to highway, local road, and bridge and tunnel congestion. The ridership forecasting for the East Side Access Project demonstrates how much time is lost by commuters who double-back across town or find alternative means of travel to work. The forecasts show that adding 24 trains to GCT in the peak hour would result in a savings of more than 24,000 person-hours each work day (see Chapter 9, "Transportation").

This separation between Penn Station and the location of commuters' jobs is expected to be exacerbated in the future, as Long Island City in Queens becomes a densely developed commercial and office district as a result of current city policy initiatives. This development is expected in the area immediately north of Sunnyside Yard near Queens Plaza and Court Square, an area that is nearly a mile from the nearest LIRR terminal at Hunterspoint Avenue, and even farther from the terminal at Long Island City.

Highway Travel Time

In the case of the LITC highways and East River crossings, travel time problems are a direct result of capacity constraints and excess demand. Congestion at bottlenecks, merge points, and toll booths slows down vehicles and increases total trip time into Manhattan. The Long Island Expressway has been called the world's "longest parking lot"; the morning radio routinely reports waits of longer than 30 minutes at the Queens-Midtown Tunnel and the East River bridges. As noted above, numerous commuters from Long Island are choosing to drive to Manhattan rather than ride the LIRR, because of perceived inconveniences associated with the railroad. This pattern is likely to increase as growth in ridership on the railroad increases crowding on the trains, as discussed above and noted in Table 1-4.

ENVIRONMENTAL PROBLEMS AND NEEDS

The primary environmental problem associated with capacity and travel constraints on the LIRR is air pollution caused by heavy traffic congestion. New York City is currently designated by the U.S. Environmental Protection Agency (EPA) as a "non-attainment area" (i.e., it does not meet federal ambient air quality standards) for carbon monoxide and ozone, which are associated with internal combustion sources, such as vehicular traffic. Manhattan is also a non-attainment area for particles small enough to be inhaled ("inhalable particulates" or PM_{10}). Similarly, Nassau County is a designated non-attainment area for carbon monoxide and ozone, and Suffolk County is a non-attainment area for ozone. Indeed, from 1970 to 1990, vehicle miles traveled increased by 110 percent, significantly increasing associated emissions of air pollutants.

Preventing further deterioration of air quality is an important goal of the East Side Access Project. Without good public transit access, people drive or ride in private cars and taxis. The continued increase in Long Island's labor force and Manhattan's white-collar employment cannot be accommodated on a constrained mass transit system. Increasing capacity on the LIRR during the peak period and providing access (and therefore reduced travel time) to the East Side would draw commuters to the railroad who would otherwise drive, reducing the vehicle miles traveled in the region.

SOCIOECONOMIC PROBLEMS AND NEEDS

The transportation system in the LITC is an economic lifeline, taking people and goods where they need or want to go. In addition, the LIRR and the city's subways have been critical in shaping development in the corridor over the last 150 years; they continue to play a key role in making the region attractive for investment and growth. A certain level of congestion on such a system is tolerable during peak periods, and is usually a sign of healthy socioeconomic conditions. But, in the long term, a system that is not organized to serve the centers of economic activity and that cannot keep pace with economic growth will undermine growth. The congestion and inconvenience associated with the area's transit system—its increasing lack of capacity, its inaccessibility to many residents, its unreliability and slow speeds, and its inability to cope with change and growth—will, over time, threaten the health of the regional economy and contribute to a decline in community character and quality of life throughout the corridor. Further, for the LIRR, the "disconnect" between the location of its terminals, particularly Penn Station, and the location of jobs induces unwanted east-west travel in the heart of the Midtown

Manhattan CBD, thereby adding to congestion and noise, impeding important local movement, and detracting from the excitement and vitality that are key to the area's character.

The LIRR and the subway system have both reached a critical condition for the region's economic well-being. The physical and operational problems described above have been cited time and again by firms moving out of the city and/or the region as reasons for relocation. If, as currently predicted, the region's population and employment base continues to expand without an echoing response in the transportation system, the situation will only worsen. As the public transportation system becomes less able to meet demand, the commuting public will turn to the automobile, increasing congestion on the corridor's limited highways and local roads. On a global scale, the region will lose ground competing for business, employment, tourists, and residential growth. On a local level throughout the corridor, the congestion from increased use of the automobile—and associated increases in noise, air pollution, and smog—will hinder people's ability to move between home, work, school, shops, or elsewhere, thus eroding community character and quality of life. These areas will become less attractive for residents, for businesses, and for investment in general.

SOLVING THE PROBLEMS AND MEETING THE NEEDS

The East Side Access Project, specifically the Preferred Alternative, would be a major contributor to solving the problems and meeting the needs outlined above. The Preferred Alternative, which is discussed in detail in Chapter 2, "Project Alternatives," would offer LIRR service directly into GCT via the existing 63rd Street Tunnel under the East River and new tunnels deep under Manhattan streets. By providing this new service, the Preferred Alternative would add capacity to the transportation network, alleviate congestion on the region's highways and many NYCT subway lines, reduce travel time from Long Island into East Midtown, provide a new station serving Long Island City and Sunnyside, improve air quality in the region, and help improve the region's overall socioeconomic condition in the future.

Adding Capacity to the Transportation System

By adding 24 new peak-hour trains into GCT, the Preferred Alternative would increase to 61 the total number of peak-hour trains serving Manhattan terminals. Not only would this 45 percent increase in service alleviate current and projected crowding on trains into Penn Station, it would free up space in Penn Station for other transportation uses and make the MNR Penn Station Access possible (see description on page 1-20).

The Preferred Alternative would alleviate the current and future projected overcrowded conditions on LIRR trains to Manhattan. Without the project, trains are expected to operate an average 127 percent over capacity at critical times within the peak period.

At the same time, the Preferred Alternative would significantly reduce crowding on a number of subway lines. With direct-to-GCT LIRR service, 8,000 fewer people would ride subways from Queens into Manhattan in the peak period (in 2020). Additionally, as described in Chapter 9, approximately 19,000 fewer people would transfer onto Penn Station area subways in the peak period (in 2020).

By offering direct-to-GCT LIRR service, the Preferred Alternative would reduce highway congestion by more than 12,000 cars each day. This reduction would be noticeable on highways in and around the LITC, and on East River crossings such as the Triborough Bridge and Queens-Midtown Tunnel (see Chapter 9, "Transportation").

Improving Travel Time into Manhattan

The Preferred Alternative would improve the travel time of most LIRR commuters and many subway riders. It would do so by reducing congested conditions on LIRR trains into Penn Station and many subway lines, and by providing commuter rail service into East Midtown Manhattan. Riders of the new service into GCT would see the most drastic improvement in travel times, shaving 30 minutes or more off their commutes in each direction (and an hour each day).

Improving Air Quality

The Preferred Alternative would support the region's clean air goals by reducing daily vehicle miles traveled by 342,000 in 2010 and 375,000 in 2020. These reductions would improve air quality in the region by reducing the emission of mobile source pollutants typically generated by automobiles. Tons less carbon monoxide, nitrogen oxides, respirable particulates (PM_{10}), and volatile organic compounds would be released into the air due to the Preferred Alternative (see Chapter 10, "Air Quality").

Improving the Region's Socioeconomic Condition

By fundamentally improving the region's transportation system, the Preferred Alternative would facilitate the region's continued socioeconomic growth. While its most visible benefit would be an improvement in the ability of employees to access jobs, it would have more far reaching effects on health and growth of the region. By significantly improving transportation links between Long Island and Manhattan, the Preferred Alternative would help meet projected population and labor force growth projections on Long Island, as well as projected employment growth projections in Manhattan. Additionally, as described in section E of this chapter and in Chapter 19, "Secondary Effects," the Preferred Alternative would combine with several other potential transportation projects for a synergistic effect to benefit the region's economy through greatly improved transportation.

D. PROJECT GOALS

East Side Access project goals were developed at the start of the planning process and refined during initial problem identification and public outreach. The alternatives developed during preparation of the MIS were selected in part based on their ability to meet these goals.

GOALS

GOAL 1: IMPROVE THE QUALITY OF SERVICE AND REDUCE TRAVEL TIME WITHIN THE CORRIDOR BETWEEN LONG ISLAND AND EAST MIDTOWN MANHATTAN

The capacity needed to meet travel demand for Long Island commuters to Manhattan should be provided, and this service should be provided in a way that will enable commuters to reach their destinations in Manhattan more directly, quickly, and conveniently than presently possible.

GOAL 2: RELIEVE LIRR TRAIN CONGESTION AT PENN STATION NEW YORK

The recent and planned capital improvements relating to Penn Station will not significantly ease limitations on the LIRR's capacity at Penn Station. Capacity constraints faced by NJ Transit and Amtrak (which are expected to worsen over the next two decades) will also not be alleviated. A

LITC improvement strategy must significantly ease congestion at Penn Station platforms, on tracks leading to Penn Station, in East River tunnels, and in the West Side Rail Yard.

GOAL 3: INCREASE MOBILITY BY SERVING NEW MARKET AREAS AND CREATING NEW MARKET CONNECTIONS WITHIN THE REGION

A viable transportation improvement strategy should facilitate and enhance regional transportation links—among NYCT subways and buses, MNR, and LIRR—to improve the quality of journey-to-work trips and to more effectively knit this patchwork of different service providers into a "seamless" network, much like the one that exists for highways. For example, a strategy should improve links between the LIRR and MNR, allowing passengers to more easily travel between points on Long Island and points north of New York City.

GOAL 4: ATTRACT NEW RIDERSHIP TO PUBLIC TRANSPORTATION BY INCREASING MASS TRANSPORTATION CAPACITY

By increasing capacity and improving service on the LIRR's service to Manhattan, the project should attract new riders to rail transit from other modes (particularly, automobiles).

GOAL 5: RELIEVE SERIOUS OVERCROWDING ON NYCT'S QUEENS BOULEVARD LINE AND FLUSHING LINE SUBWAY TRAINS

The project should improve the subway's capacity to handle more local trips, by diverting riders from overcrowded Queens subway lines to the LIRR.

GOAL 6: REDUCE CONGESTION ON AREA HIGHWAY CORRIDORS

Increasing Long Island to East Midtown capacity should enable the LIRR to tap the projected additional journey-to-work trip demand, while reducing demand and consequent congestion on area highway corridors that serve East Midtown. Improving the connection between Long Island and East Midtown should draw commuters to the rail road who would otherwise drive, easing congestion throughout the area.

GOAL 7: PROMOTE AND REINFORCE ECONOMIC DEVELOPMENT AND THE QUALITY OF LIFE OF THE NEW YORK CITY METROPOLITAN REGION

A key goal for the project is to ameliorate the congestion and inconvenience associated with the increasing lack of capacity in the area's transportation system, and particularly between Long Island and Midtown Manhattan. The capacity of the transportation system must be expanded to maintain the economic vitality of the region and the metropolitan area's competitive edge in terms of business, employment, tourists, and residential growth.

GOAL 8: CONFORM TO THE NEW YORK STATE AIR QUALITY IMPLEMENTATION PLAN (SIP) AS REQUIRED BY THE CLEAN AIR ACT AMENDMENTS OF 1990

The East Side Access Project should contribute to improved regional air quality conditions by decreasing reliance on the use of motor vehicles to enter New York City. The growing demand for transportation to Manhattan's CBD from Long Island must be accommodated in a way that prevents an increase in auto use and associated emissions of air pollutants. Preventing further deterioration of air quality is an essential component of the East Side Access Project.

GOAL 9: PRESERVE OPERATIONAL CAPABILITIES FOR EXISTING OPERATORS

To provide the greatest benefit for the region's transportation network, the changes proposed by the East Side Access Project should be designed to avoid any adverse effects on other transit providers in the region. This includes maintaining existing and planned capacity and operations for Amtrak and NJ Transit at Penn Station, in the East River tunnels, in the Harold Interlocking, and in Sunnyside Yard, and maintaining required future capacity for MNR at GCT. It also includes minimizing potential effects on and maximizing benefits to NYCT subway lines, by reducing ridership where possible on overcrowded lines, and to the extent possible, allowing flexibility for coordination with other potential transportation projects.

E. PROJECT BACKGROUND, PRIOR STUDIES, AND CURRENT PLANNING CONTEXT

PROJECT BACKGROUND

Improving mobility within the LITC—specifically alleviating highway congestion by providing a rail link between Long Island and East Midtown—has been under discussion for at least four decades. Since the 1950's, a number of studies have investigated ways to improve mobility within the LITC. Several studies have examined and supported the concept of an East Midtown rail terminal for the LIRR. A review of the history of these studies sheds light on the sequence of events leading up to this East Side Access DEIS.

PRIOR STUDIES

The first recommendation of an East Midtown terminal for the LIRR came in 1963, as part of the LIRR modernization program. Three years later New York State purchased the LIRR from the Pennsylvania Railroad and placed it under the authority of the newly created Metropolitan Commuter Transportation Authority (MCTA). Planning for the LIRR became more coordinated with planning for the city's subway system, and the concept of a joint subway-LIRR tunnel emerged. The tunnel, to run beneath the East River at 63rd Street, would have two upper tracks for subway service between Manhattan and Queens and two lower tracks for LIRR service between East Midtown and Long Island.

Passed as part of a $2.5 billion state transportation bond issue in late 1967, the 63rd Street East River tunnel was allocated $600 million. Early in 1968, two MCTA studies examined the feasibility of an East Midtown LIRR terminal to receive trains using the 63rd Street Tunnel. *Improved Passenger Service to Manhattan* recommended a LIRR terminal at GCT while *Metropolitan Transportation: A Program for Action* (sometimes referred to as "*Grand Design*") recommended, among other things, a new LIRR terminal under Third Avenue at East 48th Street with a skyscraper above. In October 1969 construction of the 63rd Street Tunnel began under the auspices of MTA, the successor to MCTA.

Despite local opposition to a Third Avenue LIRR terminal, design work continued and, by January 1975, preliminary engineering and design work was complete. (Reasons cited for the opposition to the terminal included the following: increased traffic congestion in the area, adverse effects on a residential neighborhood, excess capacity at GCT and hence an insufficient need to construct an entire new terminal.) The design called for pedestrian connections to GCT, the Lexington Avenue subways at East 53rd and East 51st Streets (E, F, and 6), and the proposed 48th Street station on the planned Second Avenue subway line. Costs were estimated at $420 million in 1975 dollars.

Continued negative reaction to the Third Avenue Terminal forced the MTA to revisit the idea of a LIRR terminal at GCT. Grand Central Alternative, published by the MTA in September 1976, called for a $332 million (in 1975 dollars) LIRR Terminal at GCT with a similar design as the proposed Third Avenue Terminal. This study called for dedicating 20 lower-level tracks to LIRR service—10 tracks on the west side and 10 storage tracks on the east side—and moving some ConRail (predecessor to MNR) operations to the upper level of GCT.

Although the fiscal crisis of the early 1970's stalled the consideration of an East Side terminal for the LIRR, the need remained. The *Penn Station Capacity and Utilization Analysis* report, completed by MTA in January 1992, affirmed that peak period commuter needs at Penn Station were constrained by a number of factors: train length limitations, lack of full access to the West Side Yard from some LIRR tracks, and capacity ceilings through the East River tunnels, to name a few. According to the report, increased demand for LIRR service was expected to worsen these conditions over the next decade. While operational changes at Penn Station (increasing station capacity from 36 to 42 trains per hour) were expected to relieve this condition slightly, a subsequent *LIRR Network Strategy Study* (LIRR, 1994) concluded that only a new terminal could fully address Penn Station's capacity constraints.

An April 1993 report, *The Operational & Physical Feasibility Study of Long Island Rail Road Access to Manhattan's East Side* (prepared by STV/Seeleye Stevenson Value & Knecht), concluded that, as originally intended, the lower level of the 63rd Street Tunnel could provide a feasible East Side access for LIRR trains. According to the report, this could be achieved by connecting the tunnel to both the LIRR's Main Line and Port Washington Branch at Harold Interlocking in Queens, and by connecting the tunnel to GCT in Manhattan. Although it was similar to the 1976 study, which came to the same conclusion, the 1993 study included more detail, evaluating a number of Queens and Manhattan connections and alignments and, for the first time, raising the possibility of midday LIRR train storage in Yard A adjacent to Sunnyside Yard rather than at GCT.

In October 1989, 21 years after construction of the 63rd Street Tunnel began, three new subway stations were opened on the 63rd Street line—East 63rd Street and Lexington Avenue, Roosevelt Island, and 21st Street/Queensbridge. The Sixth Avenue line and the Broadway line were extended northeast beneath Central Park to 63rd Street and eastward to the upper level of the 63rd Street Tunnel into Queens. NYCT is currently extending this line approximately 1,500 feet farther to connect to the Queens Boulevard line; this work is scheduled for completion in 2001 (see "Planning Context," below). The unused lower level of the 63rd Street Tunnel has been extended to just north of Sunnyside Yard.

In April 1998, an MIS was completed. This study evaluated a wide range of actions to address the mobility needs and access problems of the LITC. The MIS process, initiated in January 1995 in accordance with the requirements of the Intermodal Surface Transportation Efficiency Act of 1991 (usually referred to as "ISTEA"), set forth goals and objectives to solve the problems identified in the corridor, and developed and evaluated alternatives in a two-stage screening process (described in more detail in Chapter 2 of this document, "Project Alternatives"). Among the alternatives were: new express bus service combined with high-occupancy vehicle, or HOV, lanes; various East Side terminal alternatives, including different services using GCT and numerous alternatives with other East Side terminal locations; provision of different intermodal transfer stations at Sunnyside Yard (e.g., transfers between LIRR and NYCT subways, 42nd Street light rail transit, buses, and/or NJ Transit trains); operation of NYCT subway service on certain LIRR routes in Queens; and operation of LIRR service on certain NYCT subway routes in Queens. As a result of the MIS process, NYMTC selected a locally preferred alternative to meet the study's goals: provision of new LIRR service to GCT, from Harold Interlocking, under Sunnyside Yard, and through the existing lower level of the 63rd Street Tunnel. That alternative is evaluated in this DEIS.

CURRENT PLANNING CONTEXT

MTA LONG-RANGE PLANNING FRAMEWORK

Problems similar to those encountered in the LITC can be found in varying degrees throughout MTA's vast transportation system. Recognizing the need for system-wide improvement and the interconnections among the system's many components, MTA has developed the "Long Range Planning Framework" aimed at a unified program of improvements to its subway and commuter rail systems. This effort also recognizes that although a current map of the region's subway and rail lines would show little difference from one produced a half-century ago, the areas and the passengers they serve have seen tremendous change. In the expectation of continued changes in the 21st century, MTA is examining how its network can be expanded and adapted to meet long-term access and mobility needs. To this end, MTA and its operating authorities, in coordination with FTA and other agencies, as appropriate, are undertaking seven coordinated but independent studies. These improvements are intended to alleviate overcrowding, reduce travel time, better connect the rail and subway lines, provide high-quality service, and extend service to underserved areas. The East Side Access Project is one such project; the other six are as described in the subsections below.

All seven studies are being coordinated through the MTA Long Range Planning Framework Group, which consists of study managers and key staff from MTA and its subsidiaries, LIRR, MNR, and NYCT, with additional input from NYMTC and the Port Authority of New York & New Jersey (PANYNJ). In particular, the group has worked to make sure that the same assumptions and common evaluation criteria are used for such items as regional forecasts, current and future levels of transit service evaluation, and the future shape of the regional transit network. Although these projects, if built, would be part of the region's overall transportation system, they are independent of one another. Each has its own purpose and need and maintains its own public involvement process; each is subject to its own assessment and alternatives evaluations; and each can be built without affecting the decision to build any other.

East River Crossing Study

Sponsored by MTA and NYCT, this study assesses alternative strategies to improve transit service between Brooklyn and Manhattan, particularly considering the long-term reliability of the East River bridges for continued transit service. The Draft MIS Report for the project, completed in October 1997, concluded that the preferred alternative would construct a connection at Rutgers Street/DeKalb Avenue, to allow trains now limited to the Manhattan Bridge to also use the Rutgers Street tunnel. This would be accompanied by operational changes, including service rerouting, lengthening of the No. 3 trains to increase their capacity, and creating new transfers between Lawrence and Jay Street stations in Brooklyn and from Broadway/Lafayette and Bleecker Street (northbound) stations in Manhattan. This proposal must now be subject to public review and consideration by the MTA Board of Directors.

Manhattan East Side Transit Alternatives (MESA)

This study, sponsored by NYCT and MTA, examines NYCT's long-term needs and options for increasing transit capacity on Manhattan's East Side. Goals and objectives for the project include improving mobility, achieving economic feasibility and cost effectiveness, and maintaining or improving environmental conditions. The study has considered a full range of alternatives, and an MIS/DEIS was completed in August 1999. Detailed analyses were performed for four alternatives—the No Build, a Transportation Systems Management (TSM) Alternative that includes dedicated bus lanes on First and Second Avenues; a new East Side subway on Second Avenue north of 63rd Street and continuing on the Broadway express tracks down to Lower Manhattan; and the same new subway supplemented by new light rail transit (LRT) serving the Lower East Side and Lower Manhattan. Following public review of the MIS/DEIS, MTA and NYCT will identify a locally preferred alternative for further analysis in the Final EIS. This may be one of the alternatives described above, or it may join elements from several of the alternatives to form a combination alternative.

Access to the Region's Core (ARC)

This study—a joint planning effort of MTA, PANYNJ, and NJ Transit—began in January 1995, and examined long-term transportation initiatives to improve access and mobility from west of Hudson and Queens/Long Island to Midtown Manhattan's CBD ("the core"). Phases I and II of the ARC study considered a full range of alternatives. The study is now focusing on one alternative (Alternative AA). This alternative includes LIRR East Side Access, and permits all three of the region's commuter railroads to operate in both Penn Station and GCT. It fosters the concept of a one-seat ride from all commutersheds to both East and West Midtown, and includes a through connection between these two terminals, an expanded Penn Station, and a new two-track Hudson River tunnel. Phase 3 of ARC will include a more detailed analysis of this alternative, while also exploring variants to the alternative's alignment east of Penn Station. ARC Phase 3 will also investigate possible improvements to increase Penn Station capacity in the near term (2003-2010). The result of Phase 3 will be the selection of a locally preferred alternative, which may proceed into an EIS.

Lower Manhattan Access

This study is intended to identify, evaluate, and recommend alternatives for short- and long-term access improvements to Lower Manhattan for New York's suburban commuters using MNR or the LIRR. This MTA study, which began in the fall of 1997, is a key component of a city and state effort to maintain and enhance Lower Manhattan as a strong office center and as a 24-hour community, serving residents, workers, shoppers, and tourists. In this study, the short-term options would include steps that could be implemented quickly to improve the transfer from rail terminals to the subway and to improve the commuter's sense of comfort and convenience. Such options might encompass operating practices, rolling stock, and station improvements. Longer-term strategies would address the total commuting trip and might include major facilities, such as new routes, new stations, or altered use of existing facilities.

MNR Penn Station Access

MNR is considering options for bringing its commuter trains into Penn Station via tracks currently used by Amtrak trains for long-distance travel. In addition to provision of MNR service to Penn Station, the MIS/DEIS study is examining the need for additional stations on the

West Side of Manhattan and at Co-op City in the Bronx, and the potential for permitting diesel dual-mode through-running operations across several lines and routes.

La Guardia Subway Access Study

This NYCT study was initiated by a cooperative partnership among the State and City of New York, the Queens Borough President's Office, MTA, and PANYNJ to develop one-seat rail rapid transit access from Lower and Midtown Manhattan to La Guardia Airport, perhaps an extension of the Broadway line N train. Work on an Alternatives Analysis/Draft Environmental Impact Statement (AA/DEIS) was begun in March 1999.

POTENTIAL EFFECTS OF THE PROPOSED ACTION ON OTHER POTENTIAL TRANSPORTATION PROVIDERS

As noted above, the MTA Long-Range Planning Framework includes seven transportation studies. The proposed MTA 2000-2004 capital program identifies two efforts, based on these studies, that will be advanced through design and engineering and into construction by the end of the 2000-2004 period. These two efforts are the Second Avenue subway, based on the Manhattan East Side Transit Alternatives Study, and the La Guardia Airport Access.

Second Avenue Subway

The MESA Study has identified two build alternatives, which both include construction of a new East Side subway line under Second Avenue from 125th Street to 63rd Street, continuing via the unused Broadway line express tracks to West Midtown and Lower Manhattan. New stations would be provided along the line on the Upper East Side and in East Harlem, and a passenger transfer to the Lexington Avenue subway line would be provided at the 125th Street station. The new subway line would be built as a first phase that would be compatible with future extensions south on Second Avenue to downtown that would be built as funding becomes available. Due to its distance from GCT and the fact that it is not physically connected to the terminal, it is unlikely that a significant number of LIRR passengers arriving via East Side Access would travel on the proposed new East Side subway line.

Overall, construction activity related to the East Side Access Project would not be proximal to the construction locations of the Second Avenue subway. Coordination would continue as both projects are advanced through further engineering.

La Guardia Airport Access

The purpose of the La Guardia Airport Access project would be to provide subway access to La Guardia Airport. It is unlikely that the East Side Access Project would have an impact on the ridership of the proposed new airport service because the Manhattan portion of the Airport Access project is not proximal to Grand Central Terminal.

No locally preferred alternative for the La Guardia Airport Access project has yet been identified. Considering the La Guardia Airport Access alternatives being evaluated, construction activity related to the East Side Access Project would not be proximal to the construction locations of the La Guardia Airport Access project. Coordination will continue as both projects are advanced through further engineering.

OTHER MTA PROJECTS

A number of other major projects recently completed, now under construction, or in the planning stages affect the planning context for East Side Access. These are described below.

LIRR Projects

- *Penn Station Platform Improvements*. Platform 11 at Penn Station was recently lengthened to accommodate 12-car trains (rather than its previous 8-car train capacity). All of LIRR's platforms now accommodate 12-car trains.
- *LIRR Bi-Level Push-Pull Coaches*. LIRR's entire diesel-hauled fleet will be replaced by a new fleet of bi-level coaches which will enable LIRR passengers to have a more comfortable ride, while slightly increasing line capacity.
- *LIRR Cab Control Cars*. Some of the forthcoming new LIRR bi-level coaches will be cab control cars, which are positioned at the end of a trainset to allow push-pull train operation from this car. This saves capital and operating costs by eliminating the need to purchase an additional locomotive to accomplish this task.
- *LIRR Locomotives*. A new fleet of diesel and dual-mode locomotives will haul the new bi-level coaches. New, dual-mode locomotives (both diesel and electrically powered) will operate directly into Penn Station, allowing for a one-seat ride for passengers on non-electrified, diesel lines. Currently, all passengers on diesel lines must switch to electric trainsets (usually at Jamaica) because of restrictions on diesel locomotive operation in Manhattan. Diesel lines include the Oyster Bay Branch, the Port Jefferson Branch east of Huntington, the Greenport Branch east of Ronkonkoma, the Montauk Branch east of Babylon, and the Montauk Division west of Jamaica to Long Island City. Dual-mode locomotives will be phased in beginning in late 1999. In addition, new diesel locomotives will replace existing 1960's equipment in diesel territory.
- *LIRR Parking and Hub Development*. An expansion of parking system-wide and bicycle parking provisions will help eliminate LIRR ridership growth constraints, and development of several regional intermodal transportation hubs will encourage other means of access to LIRR stations.
- *Main Line Third Track Construction*. To expand capacity and facilitate greater levels of reverse peak and intra-Island service, the LIRR has developed plans to install a third Main Line track between Mineola and Hicksville.
- *At-Grade Crossing Elimination*. The LIRR is working with Nassau County and the New York State Department of Transportation (NYSDOT) to eliminate six at-grade train crossings in Mineola.
- *Shops and Yards*. Expansions or improvements at storage yards are planned over the 20 year horizon to efficiently and effectively provide for planned fleet growth and service expansion. Identified improvements include: storage at Huntington, south of Babylon Yard; Yaphank; Ronkonkoma; Jamaica; Hempstead; Port Washington; and Long Beach.

MNR Projects

- *Grand Central North*. Until recently, all passengers arriving at GCT had to leave the platforms using exits at the south end of each platform. This created pedestrian flow bottlenecks and imbalanced trainset loadings since many customers attempted to ride near the platform exit. The Grand Central North Project (formerly known as North End Access), inaugurated in the summer of 1999, has redressed this imbalance by constructing a series of cross passageways and street exits throughout the length of each platform, thereby offering north-end exits more convenient to many passengers' destinations. These exits have also provided a more even distribution of passengers throughout each train, and increased terminal capacity by allowing crowded rush hour platforms to be cleared more quickly. Exits have been created near East 46th, East 47th, and East 48th Streets.

- *MNR Mid-Harlem Line Third Track Construction*. An upgrade of an existing third track between Mount Vernon West and Fleetwood stations on the Harlem Line, along with new third track construction between Fleetwood and Crestwood stations, will accommodate expansion of peak service into GCT, facilitate Upper Harlem/Dover Plains express service, and accommodate the growing intra-suburban/reverse commute markets.

- *MNR Wassaic Extension*. In this project, now under construction, MNR will extend the Upper Harlem Line approximately 6 miles from its current terminus at Dover Plains north to Wassaic in the town of Amenia to serve the emerging population growth in this region. Two new stations, a layover rail yard, and a maintenance building are being constructed as part of this project.

- *MNR Parking*. As with the LIRR, additional parking spaces and the provision of bicycle storage are required to keep pace with projected MNR ridership growth. During the period from 1987-1998, 6,175 new and improved spaces were constructed in the MNR system. An additional 1,650 spaces will be added by 2000.

- *MNR Push-Pull Coaches*. MNR is purchasing 50 push-pull coaches to meet growth and service improvements for the Upper Hudson Line, the Dover Plains service, and the future extension to Wassaic. These coaches will be used to lengthen existing trains and to provide new through and express services for these non-electrified lines.

- *MNR Cortlandt Station*. MNR has completed the construction of a regional station in the Town of Cortlandt on the Hudson Line. This station resulted in the replacement of the obsolete Crugers and Montrose stations with a modern facility that has superior highway access and greater parking capacity.

NYCT Projects

- *Far West Midtown Study*. MTA/NYCT is studying options for extending No. 7 train service from its terminus at Times Square westward to the Javits Center.

- *63rd Street Tunnel Connection*. NYCT is currently constructing a two-track connection between the Queens Boulevard station at Queens Plaza and the tunnel's existing terminal at Queensbridge/21st Street. This connection to both the express and local tracks of the Queens Boulevard (E and F) line is expected to be completed in 2001. After the completion of the connection, improvements to subway service between Manhattan and Queens can be made via rerouting trains from the Queens Boulevard line to the 63rd Street Tunnel and extending the 63rd Street (B and/or Q) service to Queens Boulevard. Both of these service improvements will increase overall passenger capacity across the East River and reduce passenger crowding on the E and F lines.

- *Manhattan Bridge Reopening/T Train*. By 2004, all tracks on the Manhattan Bridge will be reopened to train traffic. At this time, the Broadway line will again operate its express service via the Manhattan Bridge. The N line will run express in Manhattan between 57th and Canal Streets, while the R line will continue to provide local service to all stations. By 2020, the Long Range Planning Framework No Build Service Plan presumes that ridership will have rebounded, following the reopening of the full Manhattan Bridge, sufficiently to warrant new rush hour express service from Brooklyn, tentatively designated as the "T" train.
- *One-Seat Transit Access to JFK Airport*. MTA is conducting a study to examine the operational and engineering feasibility of providing one-seat rail transportation access between the Manhattan CBD and Queens and John F. Kennedy International (JFK) Airport. The preferred link must be compatible with the JFK Light Rail System (LRS) currently under development (see "Other Transportation Projects in the Metropolitan Area," below). The preferred link also must be compatible with either the LIRR commuter rail system or the NYCT subway system, depending on the alignment selected. At the initiation of the study, MTA had identified four groups of potential alignment alternatives: New Rockaway Beach branch service (either LIRR or NYCT) to the LRS at Howard Beach; direct connection from LIRR to the JFK LRS at Jamaica; extension of the proposed La Guardia Airport subway line (see above) to the LRS at Jamaica; and direct connection of the NYCT subway to the LRS at Howard Beach.
- *Southeast Queens Local Area Transportation Study*. This project is examining transportation needs and opportunities for people in Southeast Queens, an area of approximately 600,000 residents. The primary focus of the study is near- and intermediate-term transit improvements (primarily through improved bus and rail service, along with improved traffic access to the rail system). The study is being coordinated among NYCT, LIRR, LI Bus, and private bus companies.
- *Other NYCT Projects*. NYCT has programmed and is implementing a wide range of track, signal, car, facility, lighting, and infrastructure improvements throughout the transit system, intended to bring the subways to a state of good repair.

HIGHWAY PROJECTS ON LONG ISLAND

A number of major highway improvement projects are planned for the LITC. These projects include:

- The creation of lanes reserved for high-occupancy vehicles (HOV lanes) along the Long Island Expressway (from exits 30-32 in Queens and 32-40 in Nassau County), together with the development of express bus service to serve park and ride lots between exits 64 and 49;
- Reconstruction and rehabilitation of the 134-mile Long Island parkway system (Northern State, Southern State, Meadowbrook, Wantagh, Sagtikos, Sunken Meadow, Robert Moses Causeway, Bethpage, and Hechscher Spur Parkways);
- Improvements along Sunrise Highway;
- Widening of Jericho Turnpike;

- Realignment and improvement of Hempstead Turnpike;
- Elimination of six at-grade LIRR crossings in Mineola (as discussed previously in "LIRR Projects"); and
- Upgrades and expansions to Long Island's Intelligent Transportation System (ITS) operations center at Hauppauge.

In addition to highway improvements on Long Island, the E-ZPass electronic toll collection system has been put in place at all tolled East River crossings. This system permits two to three times as many vehicles to be processed per hour than existing toll collection devices.

NYSDOT's Long Island Transportation Plan (LITP) 2000 Study (discussed below) investigates ways to ease traffic congestion on Long Island's highways. This study examines highway congestion in the context of the entire Long Island transportation network.

OTHER TRANSPORTATION PROJECTS IN THE METROPOLITAN AREA

JFK Light Rail System

PANYNJ is currently constructing "Airtrain," a $1.5 billion light rail link to JFK Airport. The project's first two phases, to be completed in 2002, are a 2-mile loop around the airport, linking nine passenger terminals; and a 3.3-mile extension from the airport's terminal area to rental car areas, long-term and employee parking, and the NYCT Howard Beach subway station on the A line. The project will also include a 3.1-mile connection between the airport and LIRR's Jamaica station in Queens (also the location of the Sutphin Boulevard subway station on the E, J, and Z lines), and the construction of an intermodal transportation center at Jamaica Station, linked to LIRR and NYCT subway platforms. A new control center will also be constructed at Jamaica Station. This segment is to be completed in 2003.

NJ Transit Midtown Direct (Kearny Connection)

This project, a portion of which was completed in 1996, consists of the connection of the NJ Transit Morris and Essex Line with the Northeast Corridor Line. This connection permits Morris and Essex Line train service to travel directly into Penn Station, eliminating the need for Manhattan-bound passengers to transfer at Hoboken for the PATH train. Midtown Direct will eventually permit 10 Morris and Essex trains to arrive at Penn Station during the AM peak period. Full implementation of Midtown Direct includes the ½-mile extension of the Montclair Branch to the Boonton Line, and the electrification of this line to Great Notch.

NJ Transit Secaucus Transfer

Similar to Midtown Direct service, the new Secaucus transfer station, currently under construction, will provide a transfer point from NJ Transit's Main Line, Bergen Line, Pascack Valley Line, and MNR Port Jervis Line to the Northeast Corridor Line and Penn Station. By eliminating the need for a Hoboken PATH transfer, the Secaucus Transfer will cut up to 25 minutes off the commutes of Manhattan-bound passengers. NJ Transit's package of improvements include the High Density Interlocking System, improvements to permit more than 25 trains per hour to enter Penn Station from the west. In addition, NJ Transit's East End Concourse project will create new vertical access and pedestrian spaces at the east end of NJ Transit's Penn Station area. These improvements support new NJ Transit services to Penn Station and are expected to be completed by 2001-2002.

Amtrak Northeast Corridor High Speed Electrified Service

Completion of electrification between New Haven and Boston will allow Amtrak to initiate high-speed rail service to Boston in early 2000, cutting travel time between Boston and New York to 3 hours. In addition to electrification, the new high-speed service also requires other infrastructure improvements, including changes to Sunnyside Yard in Queens. Improvements include a new service and inspection shop in the northeastern portion of Sunnyside Yard and the addition of another yard loop track.

Farley Post Office Conversion

The Pennsylvania Station Redevelopment Corporation (PSRC), a subsidiary of the Empire State Development Corporation, is overseeing the conversion of the Farley Post Office on Eighth Avenue across from Penn Station, into a new Amtrak gateway serving New York City. The existing passenger platforms will be reconfigured to allow access to both the current portion of Penn Station and the newly expanded Amtrak station area in the Farley Building. The creation of a new Penn Station will separate Amtrak operations from the commuter operations, allowing the current Penn Station to be used solely by LIRR and NJ Transit.

As part of the project, PSRC is proposing a primary pedestrian connection between the existing Penn Station and the new Amtrak area in the Farley Building through the existing pedestrian passageway under 33rd Street. This would connect the new Penn Station with the Eighth Avenue (A, C, and E) subway station and the west end of LIRR platforms. The project includes widening the passageway, reducing the grade of the ramp, improving access for disabled people, and upgrading the lighting, ventilation and life safety components. A draft Environmental Assessment has been prepared for the entire redevelopment project, including the passageway. While this new station will create additional passenger facilities, it is not expected to change or improve operations at Penn Station.

REGIONAL TRANSPORTATION PLANS IN THE METROPOLITAN AREA

Regional Transportation Plan: Mobility for the Millennium

NYMTC, in cooperation with state and local transportation agencies, is responsible for the development of a financially constrained Regional Transportation Plan (RTP) and Transportation Improvement Program (TIP) for the New York Metropolitan Region. The RTP, *Mobility for the Millennium, A Transportation Plan for the New York Region*, identifies issues and sets goals and objectives to guide transportation decision-making in the context of funding constraints and other limitations on the degree of transportation improvement that can be expected. The plan presents a vision of goals for transportation system by 2020. The following goals of the plan are relevant to the East Side Access study:

- Achieve and maintain a state of good repair on the transportation system. Objectives related to this goal include bringing transit infrastructure to a state of good repair and maintaining the system on a normal replacement cycle.
- Maximize the transportation system's level of service and manage demand. This mobility goal includes the objectives of increasing the market share of all transit modes, including (among others) rail rapid transit, local and express bus, ferry, and commuter rail.

- Develop integrated land use and transportation solutions for the short-, medium-, and long-term future. This includes taking into account how new development will affect the transportation system, and how that system should improve access to major activity centers.
- Improve the safety and security of the mass transportation system, including improving the environment of transit stations and facilities, and reducing the number of pedestrian and bicycle-related fatalities throughout the region.
- Improve regional environmental quality, balance environmental quality with the region's mobility and economic activity, and conform to the State Implementation Plan (SIP) and Clean Air Act Amendments (CAAA). A particularly relevant objective related to this goal is to minimize growth in vehicular traffic (vehicle miles traveled), thus reducing air pollution from cars, buses, and trucks (mobile source emissions).
- Identify public and private funding resources to implement the long-range plan. This goal, through its objectives, fosters increasing operating efficiencies in transportation systems, minimizes the time needed to implement projects, and develops new privatization efforts and innovative financing techniques.
- Continue to monitor the performance of the long-range plan, adding measures and projects, as necessary to achieve the goals of the plan.

The TIP addresses and coordinates specific transportation projects in the region in accordance with regional transportation goals. It is updated every two years, and must be found to conform to the SIP. The East Side Access study is included in the TIP. In addition, NYMTC, with NYSDOT, is developing the Congestion Management System (CMS) as mandated by the Transportation Efficiency Act for the 21st Century (TEA-21, which updates the Intermodal Surface Transportation Efficiency Act, or ISTEA) to carry out regional goals. CMS is not yet in final form, but has interim policies that reflect the goals and objectives cited above.

LITP 2000—Long Island Transportation Plan to Manage Congestion

NYSDOT's LITP 2000 study is a two-year, Island-wide transportation planning study to reduce traffic congestion and improve the movement of people and goods. This study will identify and evaluate solutions that will serve Long Island's transportation needs well into the next century, and will serve as a portion of NYMTC's broader regional planning efforts.

The study's initial list of types of strategies to be considered for evaluation in a MIS include: Travel Demand Management (TDM) actions, ITS, HOV lanes, physical improvements to the highway system, transit system improvements, improvements in the movement of cargo, non-motorized travel facilities (for pedestrians and bicyclists), and public/private policy initiatives (such as land use controls, flexible work hours, etc.)

New York State Air Quality Implementation Program

Under the CAAA of 1977 and 1990, areas of the country that exceed National Ambient Air Quality Standards (NAAQS) must prepare air quality plans demonstrating how standards will be attained. New York City and Nassau County, as non-attainment areas for carbon monoxide and ozone, and Suffolk County, a non-attainment area for ozone, are held to the commitments of the New York State Air Quality Implementation Plan (SIP). The New York State Department of Environmental Conservation (NYSDEC) submitted a carbon monoxide SIP demonstration of attainment study in November 1992 to EPA. This study is awaiting final approval.

The SIP contains control programs and contingency measures necessary to reduce carbon monoxide emissions to meet the standards by the CAAA attainment date of December 21, 1995. After the submission of the November 1992 carbon monoxide attainment demonstration, the attainment date was revised by EPA to December 31, 1996.

For ozone, the CAAA requires a series of SIP revisions. These revisions included air quality control measures for target years' emission reductions of ozone precursor emissions (volatile organic compounds and nitrogen oxides) and for an ozone attainment demonstration by 2007. The final SIP revision for demonstration of attainment of the 1-hour ozone standard by the year 2007 for the New York City/Lower Orange County Metropolitan Area (which includes Nassau and Suffolk Counties) was submitted by NYSDEC to EPA in November 1998. Under the 1990 CAAA, the East Side Access Project is required to conform to the purpose and specific requirements of the SIP, cause no new violations, no exacerbation of existing violations, and no delays in the achievement of NAAQS or interim emissions reductions milestones. The NYMTC RTP and TIP must also conform to the SIP.

⁂

A. INTRODUCTION

In the MIS phase, 23 alternatives were screened and evaluated, as summarized in Chapter 20, "Alternatives Screening and Evaluation." From this long list of alternatives, three alternatives were carried forward in the DEIS. As described below, these are the No Action, Transportation Systems Management (TSM), and Preferred Alternatives.

Since completion of the MIS in April 1998, these alternatives have evolved and consequently, are not identical to the No Action, TSM, or Preferred Alternative described in the MIS. The No Action and TSM alternatives have been revised to reflect current baseline conditions (for example, some of the improvements cited in the 1998 MIS have already been completed). Most important, since the MIS was published, conceptual engineering work for the Preferred Alternative has begun. This provided more specific detail about all aspects of the alternative than was available for the MIS.

B. NO ACTION ALTERNATIVE

The No Action Alternative includes improvements that will be implemented by 2010 (the year the project could be completed) and 2020 (the forecast year for the project) by the Long Island Rail Road (LIRR), regardless of whether the TSM Alternative or the Preferred Alternative goes forward. The No Action Alternative includes projects that have been approved and will be implemented by 2010 and 2020—as identified in the Metropolitan Transportation Authority (MTA) 2000-2004 Capital Plan, the LIRR's future plans, and other projects likely to be built by the analysis year. This includes completion of LIRR initiatives to bring the system into a state of good repair (such as the purchase of new rail cars, rehabilitation of certain stations, track improvements, etc.), along with major capital improvements to the LIRR system that will result in increased levels and quality of service. The No Action Alternative also includes changes to the railroad's operations plan that will be in place by 2010 and 2020.

As described in Chapter 1, "Project Purpose and Need," a number of MTA initiatives are under way to improve transportation services in the region. In addition to projects being implemented by LIRR, these initiatives include numerous improvements by MTA Metro-North Railroad (MNR) and New York City Transit (NYCT). LIRR projects to be completed by 2010 include the following:

- The LIRR's 2010/2020 operating plan calls for an increase in peak hour train arrivals at Penn Station from the current 37 to 42. All of the physical improvements needed to support such operations are currently in place.
- Twenty-three additional dual-mode locomotives will be added to the LIRR system, augmenting the railroad's recently initiated dual-mode service. These dual-mode locomotives are capable of operating on both diesel and electric (third rail) power, allowing for a one-seat ride from diesel territory into Penn Station.

- The entire diesel-hauled fleet will be replaced by a new fleet of bi-level coaches, slightly increasing line capacity. The new coaches will be hauled by the new dual-mode locomotives and by new diesel locomotives. The new coaches will include cab control cars, allowing push-pull train operation and eliminating the need for locomotives at both ends of the train.
- LIRR will be making substantial investments in new rolling stock. In addition to the new bi-level coaches, this will include replacement of more than half of the fleet of M-1 cars with 470 new M-7 cars, an overhaul of close to 20 percent of the agency's 172-car M-3 fleet, and an additional 328 M-7 cars purchased in 2005-2009 for expected ridership growth and to improve the spare ratio. To accommodate this growth, LIRR shops and yards will also be expanded. Some of the improvement may include: storage yard at Huntington; storage yard south of the existing Babylon Yard; storage yard at Yaphank; and expansion of Ronkonkoma Yard.
- LIRR plans to install a third Main Line track between Mineola and Hicksville, to be completed by 2014. (Currently, during the peak period, the LIRR uses both its tracks for peak direction trains.) The third track will allow for greater levels of reverse peak service, since it creates a track that could be used for dedicated reverse-peak trains.
- Over the next 20 years, the LIRR will gradually replace its wood ties with new concrete ties, which last significantly longer and reduce maintenance requirements. This construction work will be performed in phases, and synchronized with signal improvement work and other improvements to minimize disruptions to service.
- Substantial improvements at LIRR stations are planned over the next 20 years. Foremost among these are the plans for regional intermodal transportation hubs at Atlantic Terminal and Jamaica Station. The LIRR portion of Atlantic Terminal at Flatbush Avenue in Brooklyn will be completely rebuilt by 2010, in coordination with improvements to the nearby subway hub and development of a retail complex above the terminal. The new station will include an enlarged concourse, an air-conditioned passenger waiting room, widened passenger transfer corridors, and a new LIRR entranceway at street level.

  At Jamaica Station, substantial improvements will also be undertaken, including replacement of platforms and canopies. At the same time, the station will be integrated with the new terminus for a light rail system to John F. Kennedy International (JFK) Airport. A new overpass will be created to connect the light rail system terminus to the LIRR portion of the station. In addition, a new Central Control and Tower building will be constructed at Jamaica Station, to allow the railroad to consolidate its operating and administrative departments at one site. This center, together with proposed signal changes, will eventually allow LIRR to centrally control the activities of 13 interlocking control towers and 20 remote interlockings.
- To meet the continuing demand for additional parking at LIRR stations, the railroad will improve and expand parking lots at many stations throughout the system. This parking program will consist of reconfiguration, resurfacing, striping, capacity increases (through reconfiguration or by expansion into available fringe areas), improvements in ADA access, improvements to curbs, sidewalks, fencing, lighting, drainage, signage and landscaping, and provisions to encourage bicycle use.
- The East River tunnels are being rehabilitated in coordination with Amtrak. This involves improvements both to the tunnels themselves and to their emergency ventilation systems.

- Communications, traction power, and signaling systems will be improved systemwide. This will include gradual improvements to the signals and communications system, enabling more operational flexibility, increased speeds, and reverse commutation, and facilitating the eventual implementation of new signal technology.
- In conjunction with the Main Lane Third Track Program, an ongoing program to eliminate at-grade crossings, eight grade crossings will be eliminated to improve safety through the area.

C. TRANSPORTATION SYSTEMS MANAGEMENT (TSM) ALTERNATIVE

The TSM Alternative is designed to maximize the use of the existing transportation system without major capital expenditures. It thus serves as a comparison for evaluating the added costs and benefits of the more costly Preferred Alternative. The TSM differs from the No Action Alternative in that it includes components that, despite their low cost, are not currently planned for construction or operation by LIRR. Some components of the MIS's version of the TSM Alternative have already been constructed and are therefore not included as part of the DEIS's TSM Alternative.

The TSM Alternative was developed by considering and combining elements of several other alternatives that did not, by themselves, sufficiently satisfy project goals and objectives to warrant further consideration. The TSM Alternative contains three major transportation elements, described below: increasing the number of rail cars on LIRR trains, increasing LIRR service to the Hunterspoint Avenue and Long Island City stations, and extending the existing westbound morning contra-flow lane on the Long Island Expressway.

INCREASING LIRR TRAIN LENGTH

The TSM Alternative would create additional capacity for selected trains on the LIRR system by increasing the number of rail cars on certain peak LIRR trains to and from Penn Station. Train lengths would be increased by 2 to 4 cars, up to the limit of 12 rail cars, which is the maximum LIRR platform length. This initiative would require lengthening of selected station platforms to accommodate the longer trains; affected stations would include Port Washington, Plandome, Manhasset, Great Neck, Little Neck, Douglaston, Bayside, Broadway, and Flushing/ Main Street. It would also require reconfiguring various east end terminal yard tracks (including those at Babylon, Long Beach, and Port Washington stations) to allow the longer trains to be stored. This component would also require the purchase of additional rolling stock to create a sufficient number of 12-car electric trainsets. It would also require the devotion of additional west-end yard space at Penn Station to store the longer trainsets. Together, these changes would result in the following increases in passenger capacity:

- 2,400 additional seats per hour on the Babylon Branch;
- 1,680 additional seats per hour on the Port Washington Branch;
- 960 additional seats per hour on the Long Beach Branch; and
- 720 additional seats per hour on the Far Rockaway Branch.

INCREASING SERVICE AT HUNTERSPOINT AVENUE AND LONG ISLAND CITY

To better serve passengers traveling to destinations in East Midtown, the number of LIRR trains serving the LIRR Hunterspoint Avenue and Long Island City stations would be increased, so that more LIRR passengers could use this service and then transfer to connecting subway or ferry services to complete their trip to Manhattan's East Side. The increases to train service would be as follows:

- One additional peak hour train from Port Jefferson to Hunterspoint Avenue.
- One additional peak hour train from Yaphank to Hunterspoint Avenue.
- One additional peak hour train from Oyster Bay to Hunterspoint Avenue.
- One additional peak hour train from Patchogue to Hunterspoint Avenue.
- One additional peak hour train from Port Jefferson to Hunterspoint Avenue and then continuing to Long Island City.
- One additional peak hour train from Speonk to Long Island City.

Along with this new service, improvements would be made at the Long Island City and Hunterspoint Avenue stations to allow better transfers between the LIRR and the nearby subways and ferries, as follows (see Figure 2-1).

IMPROVEMENTS AT THE LIRR HUNTERSPOINT AVENUE STATION

Tracks and platforms would be reconfigured at Hunterspoint Avenue station to accommodate the increased service. Hunterspoint Avenue station currently has two tracks on either side of a single island platform, but additional capacity would be required to accommodate trains running in the reverse peak direction or reversing direction at the station. The existing high-level wood platform would be replaced with a high-level precast concrete platform.

In addition, to facilitate transfers between the LIRR and the subway at Hunters Point Avenue, new stairway/escalator connections and a new ADA-compliant passageway would be created. Both the LIRR station and the subway station at Hunters Point are below the grade of the street, which is on a viaduct above the LIRR tracks. Currently, passengers transferring between the stations must take stairs up to the Hunters Point Avenue bridge, traverse the sidewalk, and then take stairs back down to the subway. The new passageway would provide a dedicated pedestrian bridge between the LIRR station and the subway, and would lead to a new fare control area to enter directly into the mezzanine of the subway station. Consequently, passengers would take an escalator, elevator, or stairs up to the new passageway, travel along a walkway parallel to the Hunters Point Avenue bridge, and then enter the subway station.

IMPROVEMENTS AT THE LIRR LONG ISLAND CITY STATION

To accommodate increased train service, the tracks and platforms at the Long Island City station would also be reconfigured, and yard tracks would be changed. The Long Island City station currently has two low-level station platforms and an adjacent yard that provides midday train storage on 13 tracks. To allow several trains to load and unload simultaneously and to reduce conflicting yard movements, the existing yard tracks would be realigned to provide four 850-foot-long high-level, precast concrete platforms serving eight tracks. High-level platforms are required because the new bi-level cars are only accessible via high-level platforms.

Also at the Long Island City station, a new 500-foot-long covered pedestrian walkway would be created between the station and the East River ferry terminal. This walkway would follow the existing public right-of-way along Borden Avenue, through the New York Waterway parking lot to the ferry slip. Ferry service between the Long Island City ferry terminal and East 34th Street

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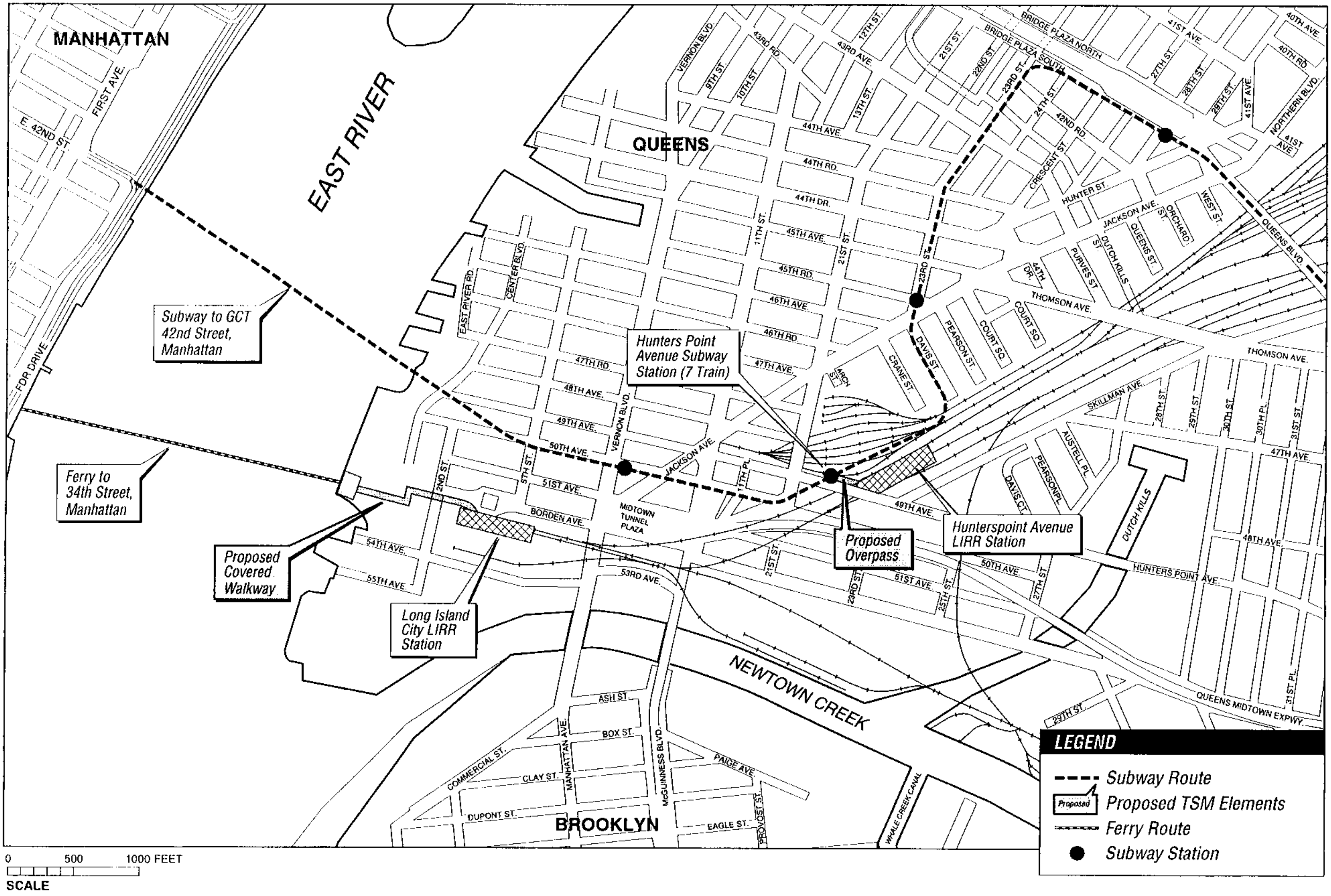

MTA / LIRR

East Side Access

Figure 2-1

TSM Alternative: Long Island City Elements

in Manhattan would be coordinated with new LIRR service to Long Island City. Based on ridership forecasts for the TSM Alternative, the existing ferries and ferry slips in both Queens and Manhattan would be able to handle the additional passengers transferring from the railroad. If demand requires, the current 64-person ferries could be replaced with 250-person ferries during peak periods, or an additional slip could be added in Queens.

In Manhattan, timed connecting buses would distribute ferry riders to Midtown Manhattan destinations along 34th, 42nd, and 49th/50th Streets. New York Waterway's existing bus service would be retained and supplemented to provide this service.

CONTRAFLOW BUS/TAXI LANE

This initiative would extend the existing inbound (westbound) contra-flow bus lane that currently operates in the morning peak period on the Long Island Expressway (LIE) between the Queens-Midtown Tunnel toll plaza and Greenpoint Avenue in Queens. The AM-only westbound contra-flow lane would be extended 3.6 miles to the east, to 102nd Street in Corona, Queens near the Grand Central Parkway interchange. This would improve morning peak hour travel time for Queens express bus service to Manhattan by using one lane on the eastbound side of the LIE for westbound bus and taxi service.

This improvement is based on the New York State Department of Transportation's (NYSDOT) Contra-flow Advance Alternative II as analyzed in their May 1994 *NYSDOT HOV Feasibility Study* and refined in their *Assessment of Extended Preferential MOV Lane in Western Queens* study published in May 1997.* These studies, which were conducted for the section of the LIE from the Queens-Midtown Tunnel to Grand Central Parkway, identified new or expanded low-cost High Occupancy Vehicle (HOV) or Multiple Occupancy Vehicle (MOV) options for westbound morning traffic using contra-flow lanes and moveable barriers.

Currently, two sections of the LIE operate with HOV lanes and one additional section is currently under construction. The first segment, implemented in 1971, is a single contra-flow lane from the Queens-Midtown Tunnel to Greenpoint Avenue, about 2 miles. This lane is open to buses, occupied taxis, and permit vehicles during the westbound (inbound) weekday morning peak period (7 AM to 10 AM). During this period, the contra-flow lane uses one lane on the south, or eastbound, side of the LIE for westbound traffic. The second HOV segment on the LIE, begun in 1994, provides one HOV lane in each direction between Exit 40 (Jericho) and Exit 64 (Medford) in Suffolk County. These lanes are not contra-flow lanes, but rather concurrent-flow HOV lanes, carrying buses, carpools, and vanpools traveling in the same direction as other traffic on that side of the highway. In addition, concurrent-flow HOV lanes are currently under construction from Exit 32 (Little Neck) to Exit 40. When this work is complete, there will be a continuous HOV lane on the LIE from approximately the Nassau-Queens border to Medford, in Suffolk County.

The TSM Alternative's bus and taxi lane would extend the existing lane from its current terminus at Greenpoint Avenue east to 102nd Street (see Figure 2-2). Vehicles could enter the new lane in two places: near 102nd Street or via a new on-ramp and flyover just east of 74th Street.

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* Due to monetary constraints, NYSDOT's 1997 study recommended a bus-taxi lane shorter in length than the bus-taxi lane component recommended in their 1994 study. However, the additional travel time savings to be gained by the longer bus-taxi lane led to the decision to retain the 1994 study's recommended configuration for inclusion as a component of the DEIS's TSM Alternative.

Near 102nd Street, buses and taxis would enter the contra-flow lane via a gap in the median that normally separates the westbound and eastbound sides of the highway. Just east of 74th Street, the flyover would carry entering vehicles from Queens and Woodhaven Boulevards over the three westbound lanes of the LIE and across the highway median to a new contra-flow lane on the otherwise-eastbound side of the road. The flyover ramp would speed access to the LIE contra-flow lane for the multitude of express buses entering from Queens and Woodhaven boulevards, significantly cutting travel times into Manhattan.

Along its entire length, the westbound contra-flow lane would be segregated from opposing eastbound traffic by plastic tubular stanchions and by signage and signals that indicate that the contra-flow lane is in operation.

The bus/taxi lane would operate only in the westbound AM peak direction, from 6:30 AM to 10 AM. During the evening peak, reverse (inbound, or westbound) traffic volumes are too heavy to allow use of one of the westbound lanes for eastbound traffic.

Construction of the flyover and ramp between 74th and 80th Streets would necessitate reconstruction of all the westbound traffic lanes and the service ramps and lanes in this area. In addition, where the LIE passes beneath LIRR at 86th Street, the eastbound LIE would have to be reduced from three to two lanes so that the contra-flow lane (which would occupy one—typically the eastbound—lane) could fit beneath the overpass as well. However, according to the 1994 NYSDOT study, the eastbound traffic volumes at that location require three lanes. A potential solution would be to close the on-ramp from the eastbound service road, which would reduce volumes on the primary LIE eastbound lanes enough that two lanes would be sufficient. Eastbound traffic that normally would enter the LIE here would instead enter by continuing along the service road and using a new, two-lane on-ramp east of Queens Boulevard. According to NYSDOT's study, the eastbound service road has enough capacity to handle this rerouted traffic during the morning peak period. Constructing the contra-flow lane would require a reconstruction of the LIRR bridge at 86th Street.

COSTS

Capital costs take into account only the costs associated with the system improvements required for the TSM Alternative. Funding required for initiatives included in the MTA Capital Program are not included in this summary of estimated capital costs. Capital costs for the TSM Alternative are estimated at $655.6 million (in dollars escalated to the midpoint year of construction), as outlined in Table 2-1.

Table 2-1

Capital Cost Estimates: TSM Alternative

Component	Cost (in millions)*
Increased Ferry Service	24.1
Increased Number of Rail Cars on Peak Trains	214.1
Extension of LIE Bus/HOV Lane	75.7
Increased Service to Long Island City and Hunterspoint Avenue LIRR Stations (and related improvements)	341.7
Total Capital Costs:	655.6

Note: * All costs escalated to the midpoint year of construction.

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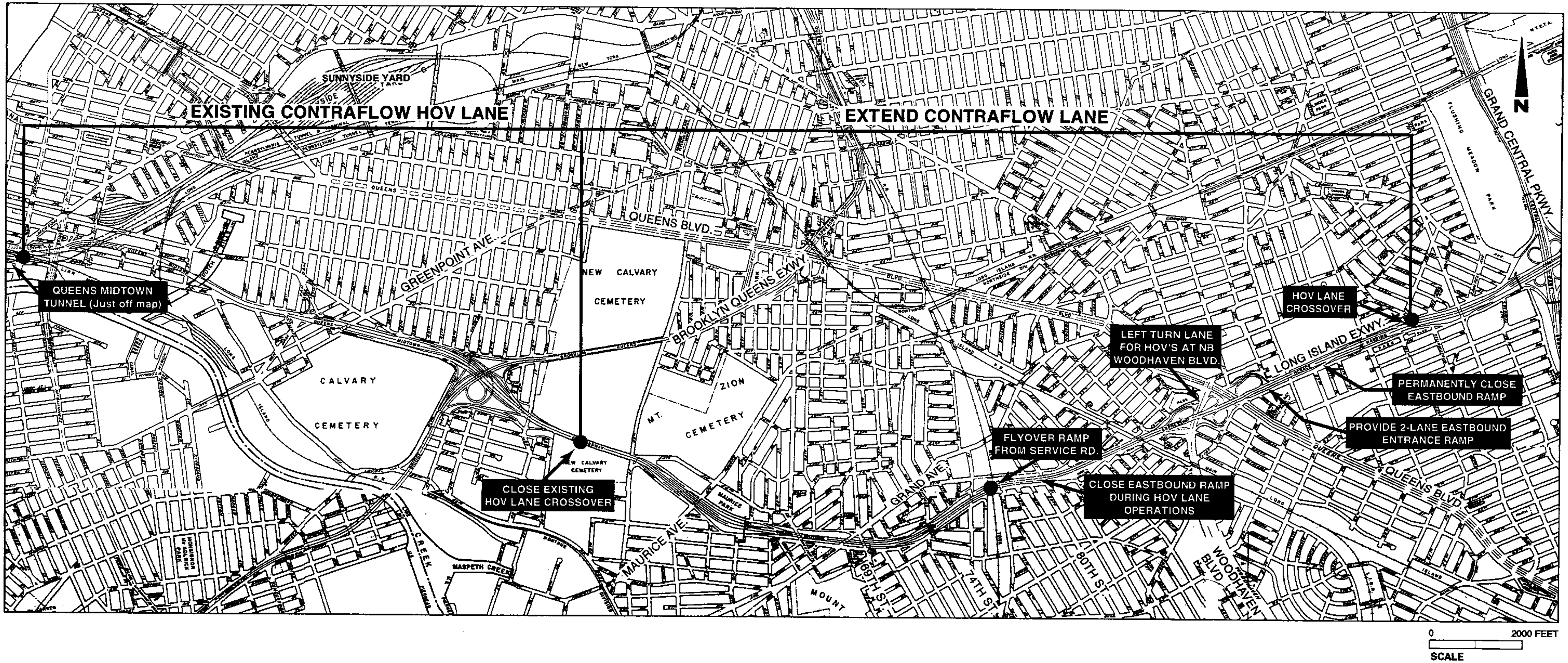

Figure 2-2

TSM Alternative: Extension of Contra-Flow Lane

D. PREFERRED ALTERNATIVE

OVERVIEW

The Preferred Alternative would establish a direct link from the LIRR Main Line and Port Washington Branch to Grand Central Terminal (GCT). As shown in Figure 2-3, the new service would branch away from existing LIRR tracks at Sunnyside Yard in Queens and travel in tunnels beneath Sunnyside Yard and LIRR's Yard A at Sunnyside. It would continue in the currently unused lower level of the existing 63rd Street Tunnel beneath the East River. In Manhattan, the service would continue west from the tunnel's terminus at Second Avenue and 63rd Street, in one of two possible tunnel configurations (referred to as Option 1 and Option 2, described below). In both options, service would head west toward Park Avenue and then south, beneath the existing MNR tracks under Park Avenue, into GCT. At GCT, LIRR would have new tracks, platforms, waiting areas, ticket windows, and other services.

The following sections describe each component of the Preferred Alternative (including both tunnel alignment options in Manhattan), beginning with elements in GCT and following the route out toward Long Island. The general location of each element is shown in Figures 2-3 and 2-4.

GRAND CENTRAL TERMINAL

The Preferred Alternative would bring LIRR passengers to a new LIRR terminal at GCT, one of New York City's most prominent historic structures and a major transportation hub. The following sections provide a brief discussion of GCT as it currently exists and also describe what would be constructed in GCT under each option of the Preferred Alternative.

GRAND CENTRAL TERMINAL TODAY

While the monumental terminal building stands on a site between East 42nd and East 44th Streets, from Vanderbilt to Lexington Avenues, the terminal itself actually occupies a much larger area, with tracks extending beneath buildings and streets from midblock between Vanderbilt and Madison to Lexington Avenues as far north as 50th Street. Including its concourses, passages, and underground platform and yard areas, GCT occupies some 48 acres of Midtown Manhattan. The terminal has recently undergone a major restoration project, in which surfaces —including the Main Concourse's famous zodiac ceiling—were cleaned and restored; a new grand staircase was created on the east end of the Main Concourse to match the one on the west; a new MNR arrival and departure board was installed; and new escalators, a lower level Dining Concourse, and numerous new retail stores were created. GCT is currently the main terminus for commuter rail service provided by MNR and an important hub for NYCT subway service (the Lexington Avenue Nos. 4, 5, and 6 lines, the No. 7 Flushing line, and the Shuttle between GCT and Times Square). It once served long-distance travelers as well, but Amtrak service to GCT ceased in the early 1990's, when it was shifted to Penn Station.

The public spaces at GCT are on two levels: the Main Concourse, or upper level; and the Dining Concourse, or lower level (see Figure 2-5). Those two concourses provide access to two levels of tracks and platforms. The westernmost tracks on both levels are lower than the eastern tracks, to allow for one of the terminal complex's most significant engineering features: an upper- and lower-level loop track that circles beneath the main terminal building. The two-level loop track allows trains on the westernmost tracks on either the upper or lower level to exit the station by continuing forward, circling under the station and reconnecting to the easternmost tracks. The other tracks at GCT are stub-ended—i.e., they terminate at GCT—so that trains must reverse directions to exit.

The Main Concourse is the primary public space at GCT, and its high, vaulted ceilings make it one of the signature spaces in New York City. The Main Concourse (upper-level concourse) is entered from street level on 42nd Street via a hallway that passes through Vanderbilt Hall, and also from the Met Life building to the north via staircases or escalators. Two main stairways ascend from the Main Concourse up to Vanderbilt Avenue on the west and to retail space on the east, while a number of passageways connect the Main Concourse to 42nd Street, Lexington Avenue, and the Shuttle and Lexington Avenue subways. To the west of the primary entrance hall leading from 42nd Street, the southern wall of the Main Concourse houses the ticket windows and a large timetable/destination board for MNR. A similar bank of ticket windows is east of the entrance hall, but those windows are not in regular use. Just west of the Main Concourse is the Biltmore Room, an open room currently occupied by a large newsstand. On the north, the Main Concourse leads to the upper-level tracks, tracks 11-42 (some of these tracks are accessed from hallways to the east and west of the Main Concourse). As mentioned earlier, the westernmost of the upper-level tracks (tracks 38-42) are connected to a loop track.

The Dining Concourse, or lower level, lies just below the Main Concourse. The Dining Concourse is connected to the Main Concourse via a number of stairways, ramps, and escalators. As part of the restoration of GCT, the Dining Concourse is being converted into a dining area, with restaurants and public seating areas. Like the Main Concourse and its upper-level tracks, the Dining Concourse is connected on the north to lower-level tracks 101-117, which lie below the upper-level tracks.

The westernmost tracks on the lower level (west of lower-level track 117) are inaccessible to the public. These tracks comprise Madison Yard, an area where MNR currently stores trains during the midday and performs light maintenance work. One of the westernmost Madison Yard tracks is connected to the lower-level loop track.

As mentioned above, the GCT complex occupies a large area beneath the streets and buildings between Madison and Lexington Avenues. The passageways and public spaces in the terminal are located beneath buildings between East 42nd and roughly East 45th Streets; numerous exits from the upper level of the terminal are through office buildings surrounding the main terminal building. The platform area of the terminal extends north as far as 48th Street, from near Vanderbilt Avenue to close to Lexington Avenue. To allow pedestrians to take advantage of this layout, MTA has recently opened four new entrances to and exits from GCT from the north. These are at the East and West Walks in the Helmsley Building (between East 45th and East 46th Streets), on East 47th Street close to Madison Avenue, and on East 48th Street just east of Park Avenue. The new entrances connect to all the MNR platforms via several "cross passages" —east-west passageways that link each of the platforms via stairs, escalators, and elevators. Between East 50th and East 57th Streets, the two levels of MNR tracks merge into one level of four tracks that continue north under Park Avenue to East 96th Street, then on a viaduct above Park Avenue, to the MNR 125th Street station.

EAST SIDE ACCESS AT GRAND CENTRAL TERMINAL

The Preferred Alternative would bring new LIRR service under Park Avenue beneath the MNR tracks to GCT. The project would have 10 tracks and five center-island platforms to handle the

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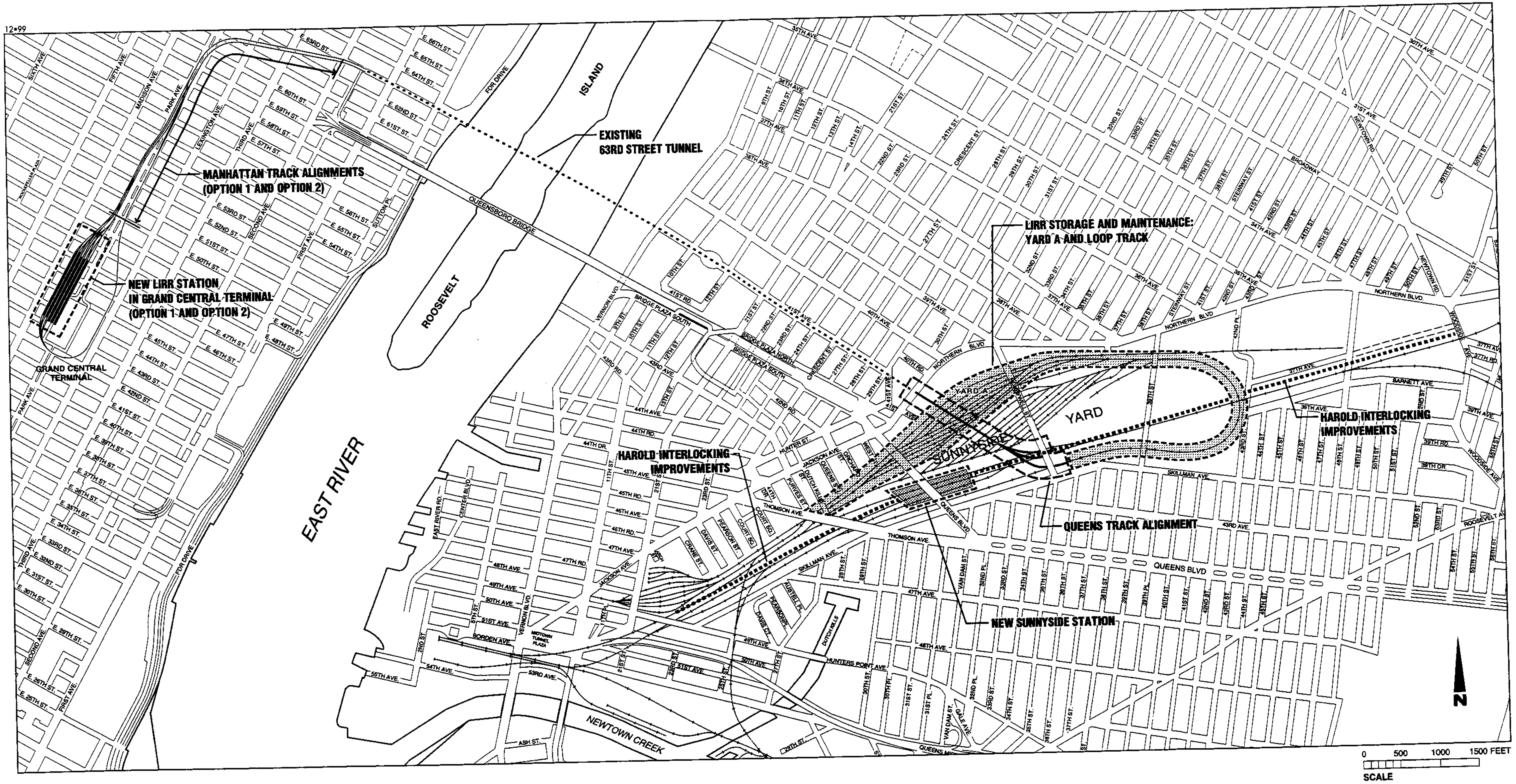

Figure 2-3
Project Elements in Manhattan and Queens

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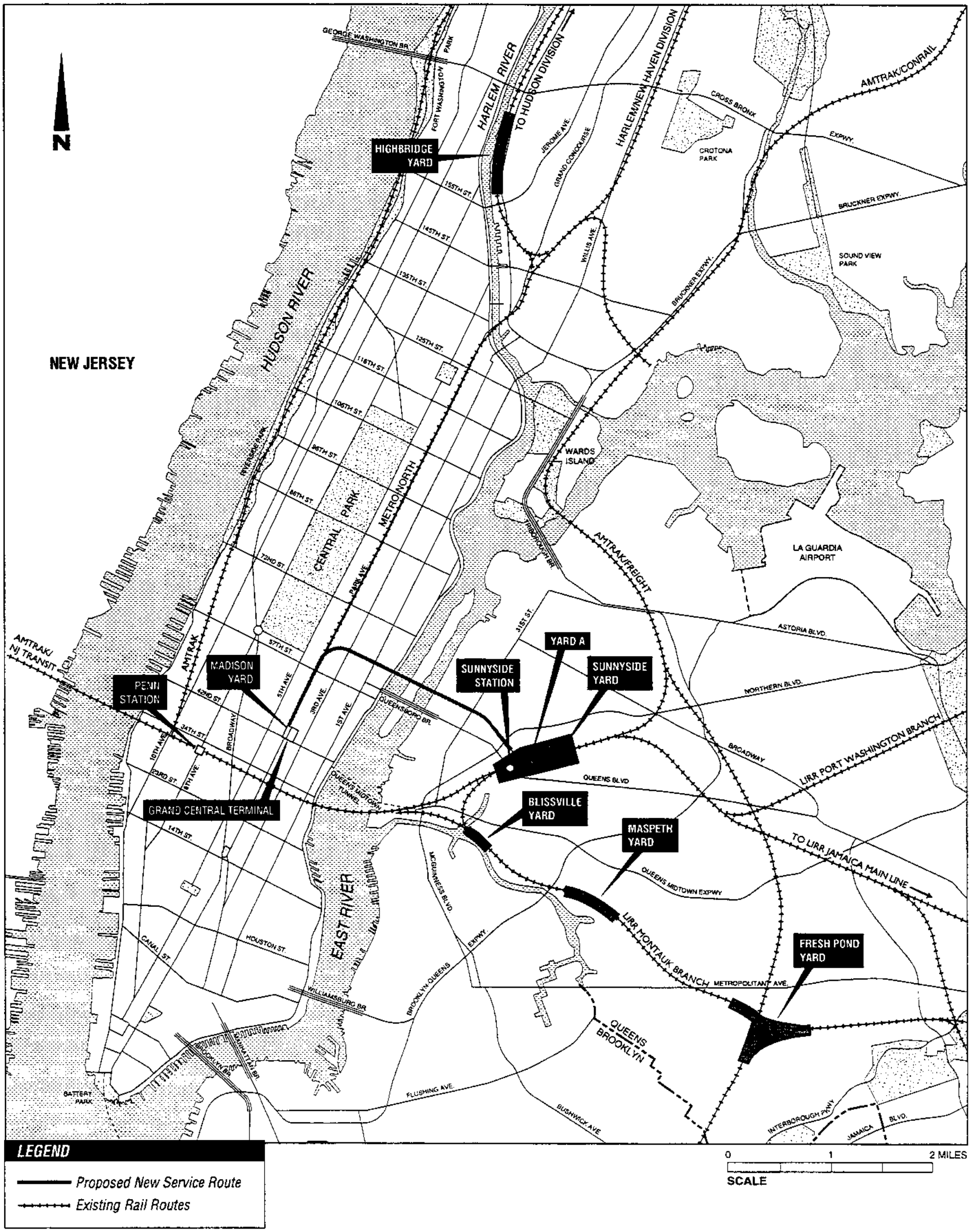


Figure 2-4

Context Map

- At the northeast corner of East 48th Street and Park Avenue (outside the Westvaco Building);
- On the north side of East 47th Street between Madison and Park Avenues (outside the Chase building); and
- On the south side of East 47th Street between Madison and Park Avenues (this entrance is currently under construction as part of the new building at 383 Madison Avenue).

At street level, the access points would likely be similar in design to those recently opened for MNR passengers. Some of the new entrances would be within existing buildings, where they would either occupy a storefront or create a new entrance into the building. Others would be covered entrances from the sidewalk.

Option 2: New Deeper Station in GCT

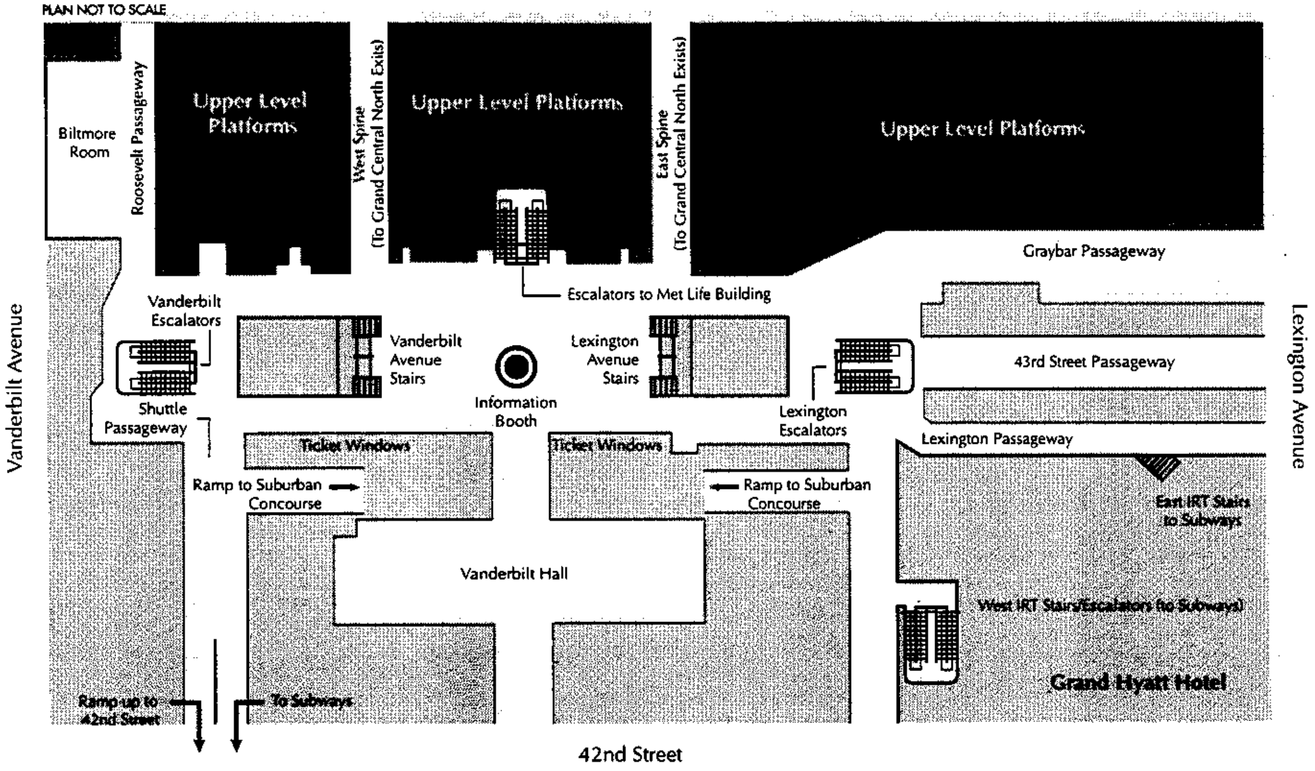
Like the new lower-level terminal provided by Option 1, Option 2 would have 10 LIRR tracks served by five center-island platforms for LIRR trains at GCT. However, these new tracks and platforms would be located on a new, deeper level some 77 feet (about 7 stories) below GCT's lower-level tracks. This alternative was developed to simplify the complicated construction processes in Manhattan to bring new service to GCT. As detailed in Chapter 17, "Construction and Construction Impacts," Option 2 would allow the use of different tunneling techniques and would isolate the construction work from existing railroad and subway tunnels and building foundations.

Each platform would have stairs and escalators rising to east-west passageways just above and perpendicular to the platforms. From these common passageways, stairs and escalators would rise to a large mezzanine for the LIRR (see Figure 2-10). The new mezzanine area would occupy the westernmost track area of GCT's lower level—the area that would be used for LIRR's new tracks and platforms under Option 1. As described above, that area is currently occupied by 4 tracks used for MNR service (tracks 114-117) and the tracks of MNR's Madison Yard. The new finished mezzanine space would be separated from MNR's track area to the east, and would be well lit and climate-controlled. It would include passenger amenities, such as ticketing booths, information booths, waiting room seating, retail elements (newsstands, etc.), and required LIRR administrative and operational support spaces. A longitudinal section of the mezzanine, tracks and platforms, and vertical circulation elements is shown in Figure 2-11. As shown in Figure 2-12, the mezzanine would be located adjacent to MNR's lower level tracks and connect to GCT's Dining Concourse. Option 2 would have seven of the same exit locations as Option 1, described above. The Met Life exit would be replaced by an exit at 335 Madison Avenue. Option 2 would also provide a connection directly into the GCT Dining Concourse via stairs and an elevator at the southern end of the LIRR mezzanine. It would not connect into the Biltmore Room at GCT.

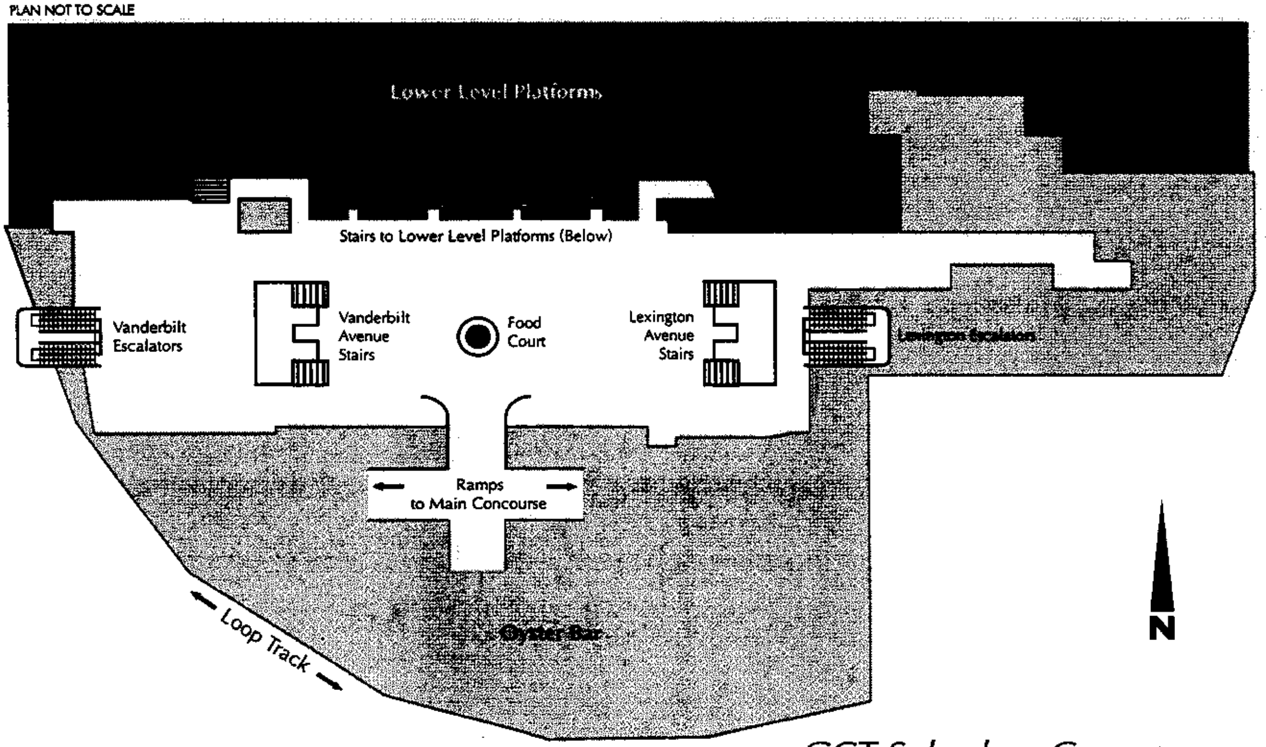
MANHATTAN TRACK ALIGNMENT

PROJECT ROUTE TODAY

As mentioned earlier, MNR travels from GCT under Park Avenue. Tracks and platforms occupy a wide area of the terminal, extending beneath buildings from Lexington to Madison Avenue. Between roughly East 49th and East 52nd Streets, the track area narrows, and north of 55th Street, the railroad travels only beneath Park Avenue. At the same time, the lower level tracks



GCT Main Concourse



GCT Suburban Concourse

■ *Track and Platform Areas*

▨ *Retail and Other Areas*

Figure 2-5

Existing Floor Plans: Grand Central Terminal

new LIRR service. Two engineering options are being considered for the location of those tracks and platforms: Option 1, which would bring trains to the west side of the existing lower level of the terminal, and Option 2, which would bring trains to a new level beneath the existing lower level. These are described below.

Option 1: Station in Existing Lower Level of GCT

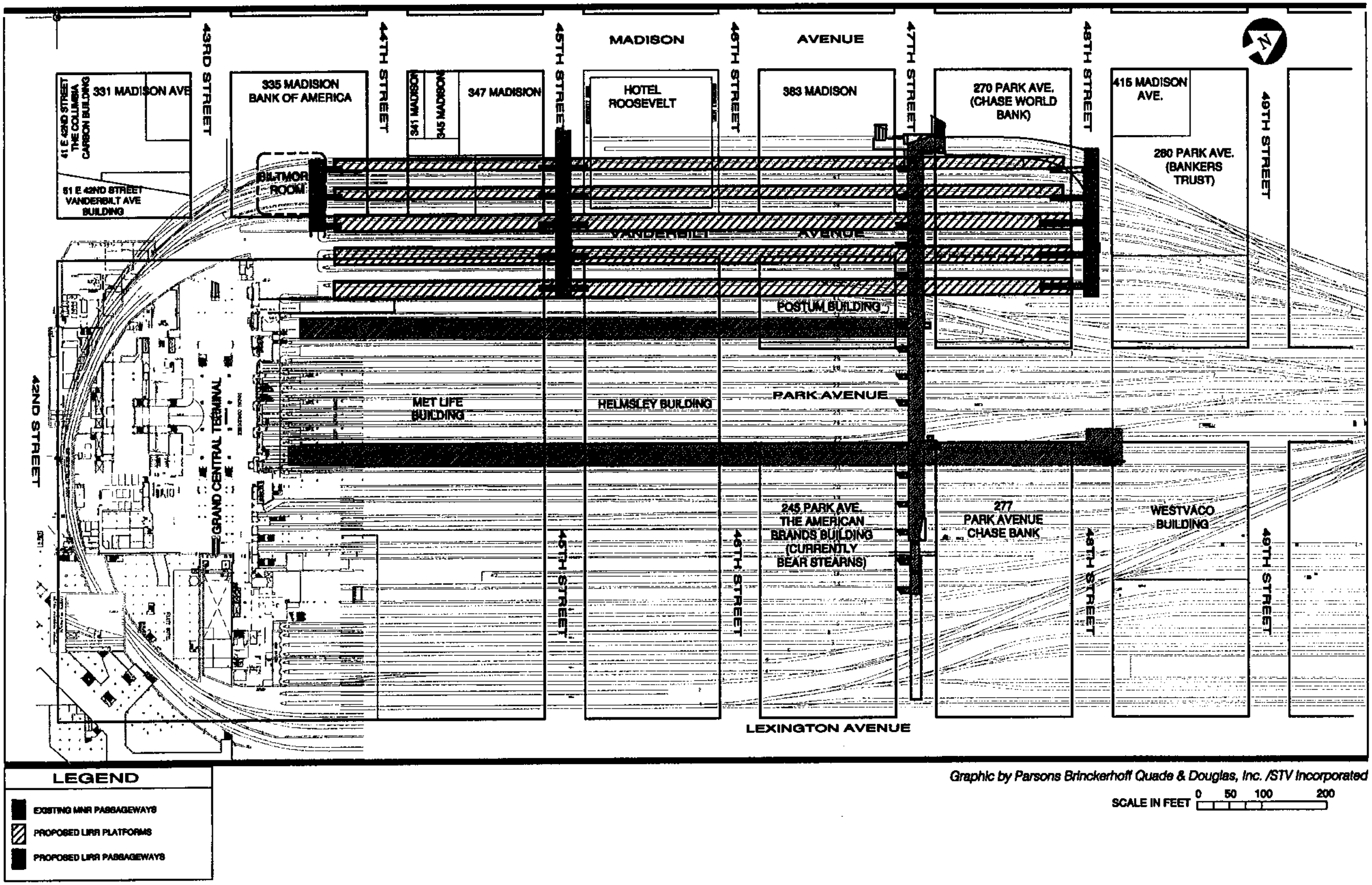
In Option 1, LIRR's new track and platform area would occupy the westernmost track area of GCT's lower level, including Madison Yard. That area is currently occupied by 4 tracks used for MNR service (tracks 114-117) and MNR's Madison Yard. The new LIRR tracks would be designated, from east to west, tracks 201-210. Tracks 201 to 205 would be stub-ended, while tracks 206 to 210 would be connected to the existing lower-level loop track (see Figure 2-6). The new platforms would be designated, from east to west, 1, 2, 3, 4, and 5. The new track area for Tracks 205-210 would be lower than the existing MNR tracks to the east.

The new LIRR platforms would connect to two new LIRR passenger spaces: a passenger waiting/access area below the Dining Concourse level at the LIRR platform level, and a similar, but larger space adjacent to the existing Dining Concourse. All platforms would connect to the new platform-level room, either directly (from Platforms 1, 2, and 3) or via an underpass (from Platforms 4 and 5, beneath the loop tracks at the end of those platforms). The new platform-level passenger area would have escalators connecting to the new LIRR Concourse above; from there, another escalator would connect to the Biltmore Room on the Main Concourse level. Platforms 4 and 5 would also have a direct connection, via escalators and elevators, to the Biltmore Room on the Main Concourse level (see Figures 2-7 and 2-8). The LIRR Concourse would house most LIRR passenger facilities, including waiting rooms, ticketing areas, and information. As shown in Figure 2-8, the new escalators to the Biltmore Room would be at the northern end of the room, near the existing doorways leading to MNR's tracks 39 through 42.

In addition to the entrances from GCT described above, passengers would also access the new LIRR platforms from various points north of the terminal, similar to the Grand Central North entrances recently opened for MNR customers (see Figure 2-9). All of the new LIRR platforms would be connected to new east-west passageways leading to these entrances/exits. The platforms would also be connected to the recently opened 47th Street east-west passage created for MNR, and would provide access to those entrances/exits as well. A total of eight access points north of GCT would lead to the new LIRR platforms (see Figure 2-9). Five would be newly constructed as part of the Preferred Alternative at the following potential locations:

- Within 347 Madison Avenue (at East 45th Street);
- At the southeast corner of Vanderbilt Avenue and East 45th Street (outside the Met Life Building);
- On the south side of East 47th Street between Park and Lexington Avenues (outside of the American Brands Building at 245 Park Avenue);
- On the southwest corner of East 48th Street and Park Avenue (outside of the Chase building at 270 Park Avenue); and
- Within the Bankers Trust building at 280 Park Avenue, on the north side of East 48th Street between Madison and Park Avenues.

The three other access points were recently constructed as part of the Grand Central North project, and would be shared with MNR customers.



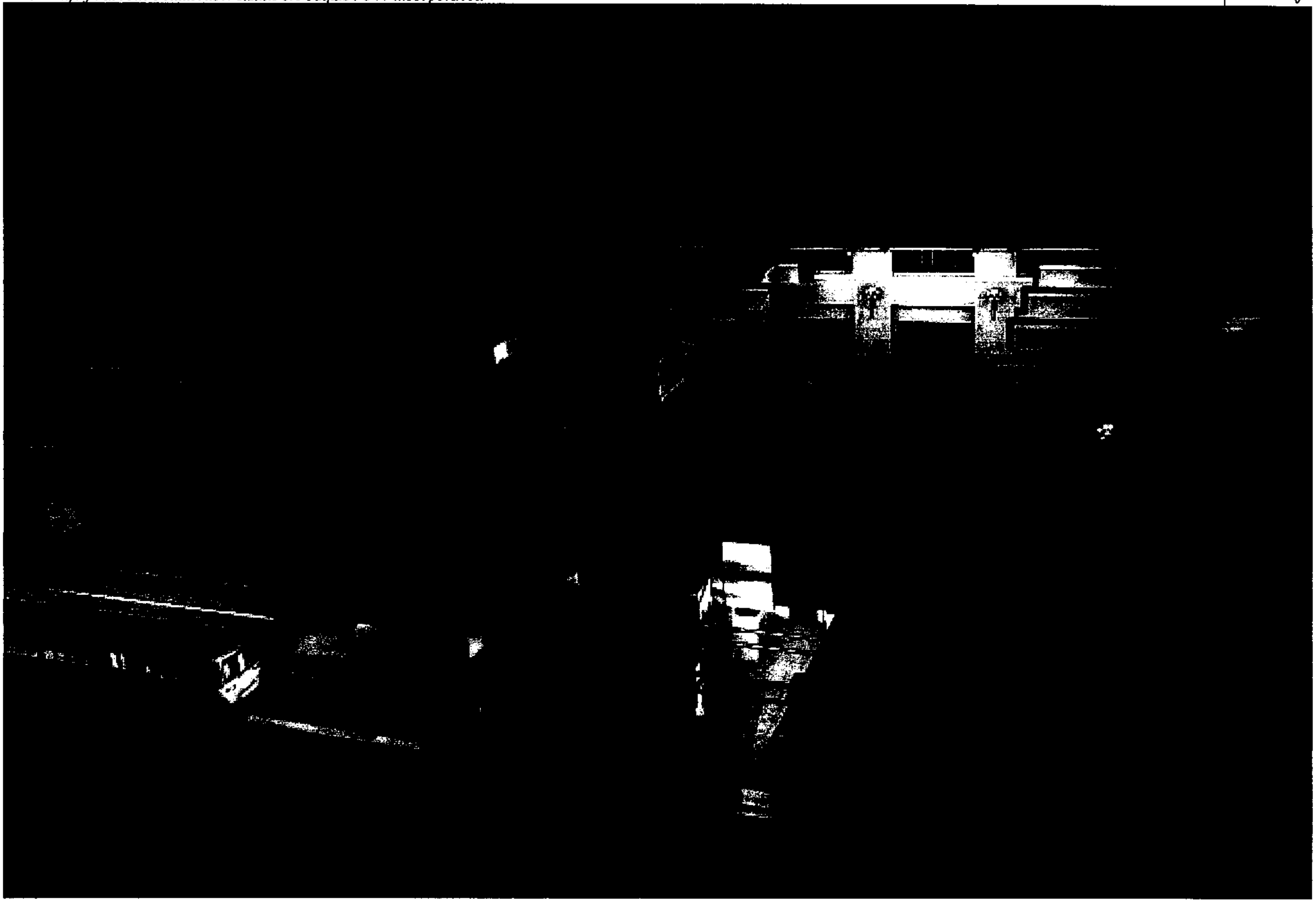
Graphic by Parsons Brinckerhoff Quade & Douglas, Inc. /STV Incorporated

Figure 2-6

GCT Lower Level Platform and Cross-Passageway Layout - Option 1

Rendering by Parsons Brinkerhoff Quade & Douglas / STV Incorporated

Draft: For Illustrative Purposes Only

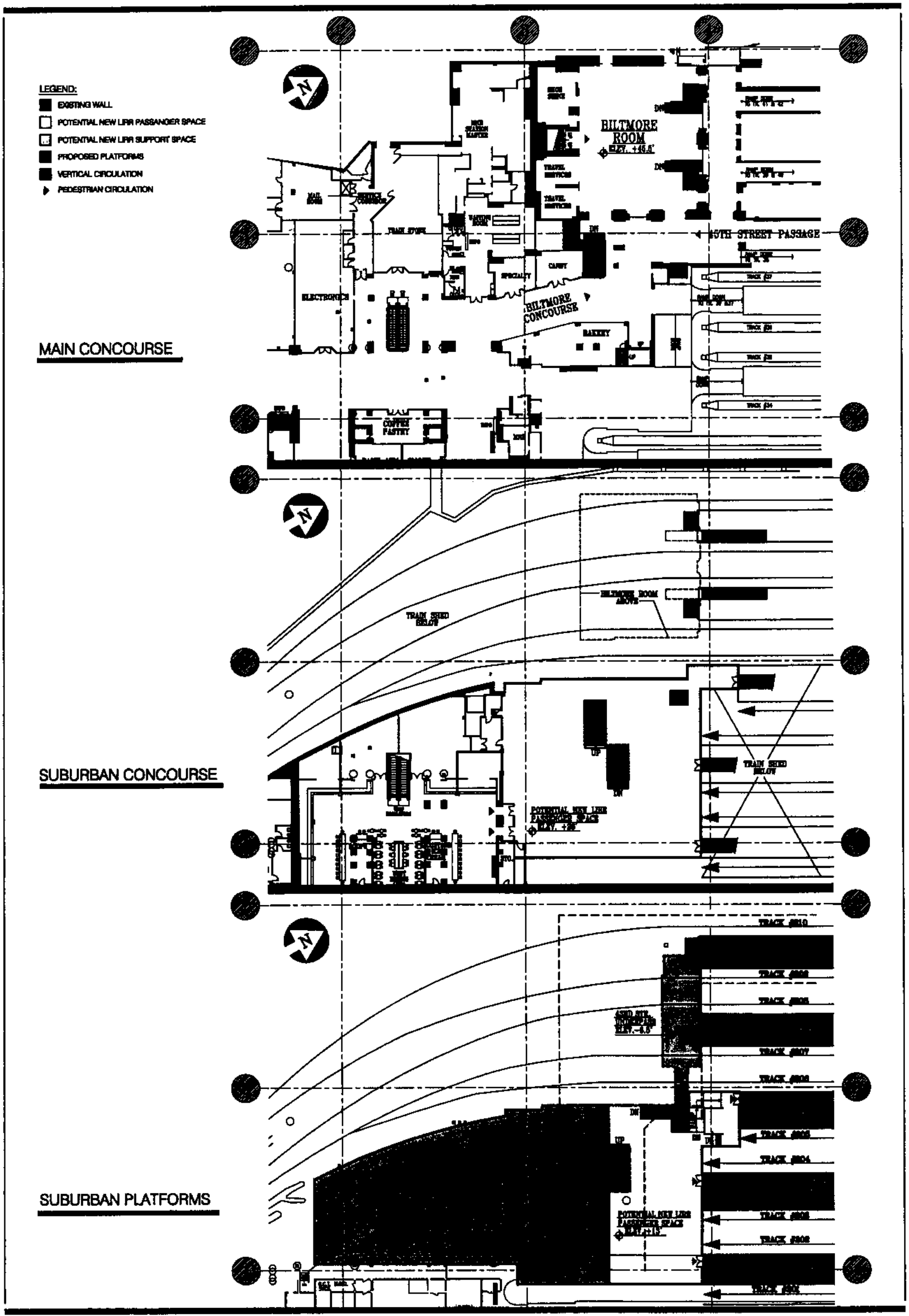


MTA / LIRR

East Side Access

Figure 2-7

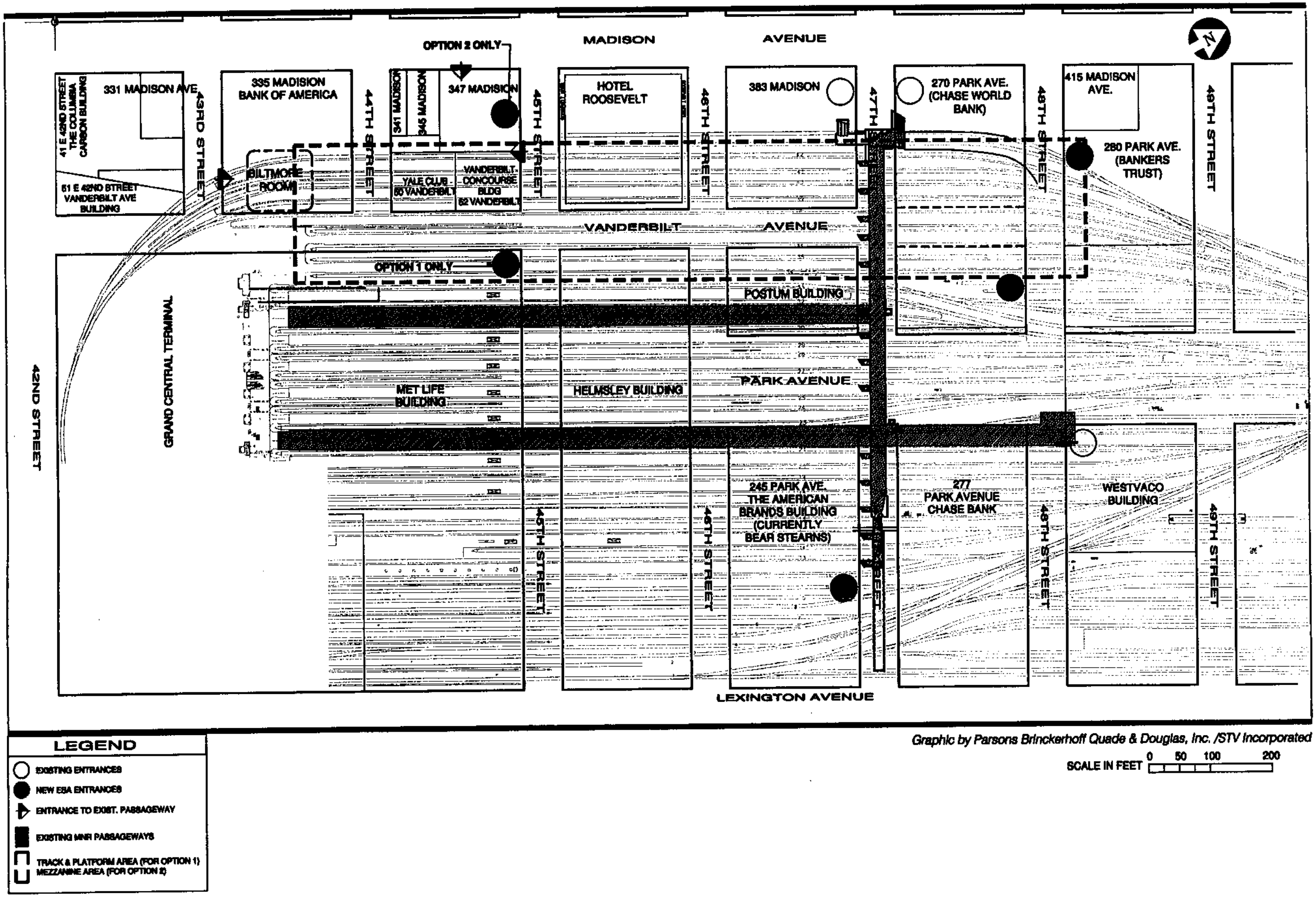
New Escalators into Biltmore Room - Option 1



Graphic by Parsons Brinckerhoff Quade & Douglas, Inc. /STV Incorporated

Figure 2-8

Mezzanine Elements in GCT: Engineering Option 1



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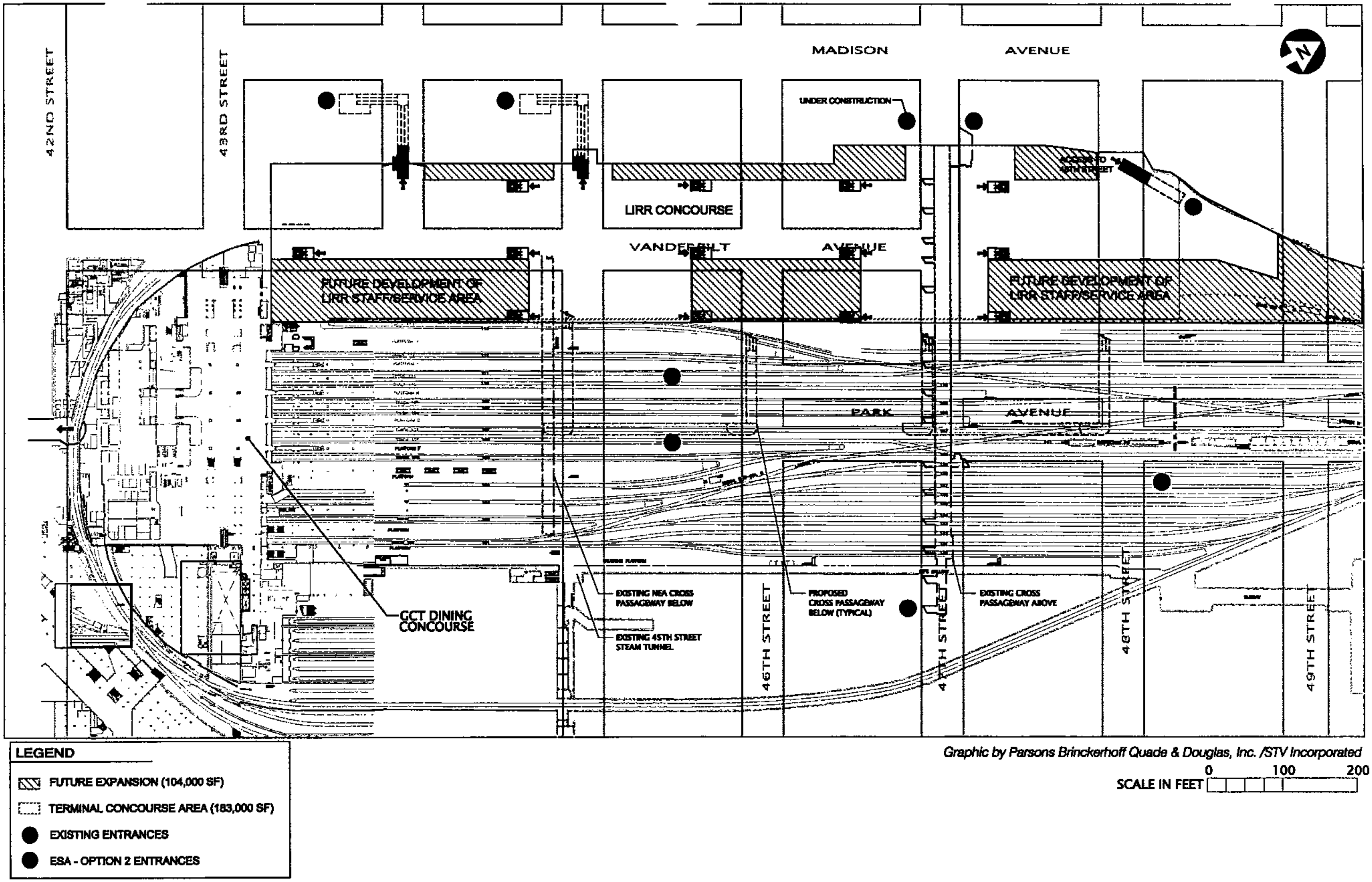
MTA / LIRR
East Side Access

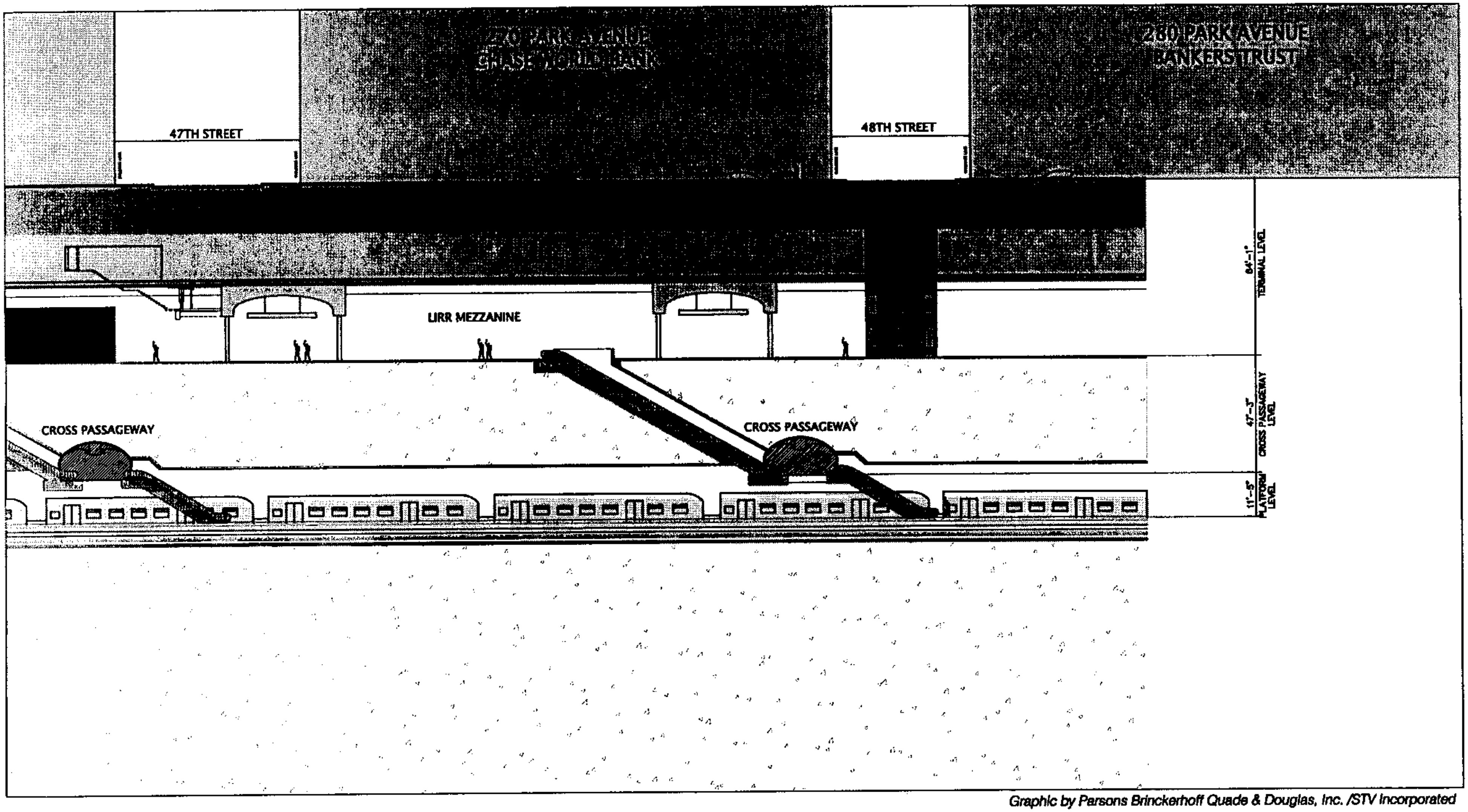
Figure 2-9
Proposed Street Entrances: Options 1 and 2


42ND STREET
43RD STREET
MADISON
AVENUE
N
UNDER CONSTRUCTION
ACCESS TO 48TH STREET
LIRR CONCOURSE
VANDERBILT
AVENUE
FUTURE DEVELOPMENT OF LIRR STAFF/SERVICE AREA
FUTURE DEVELOPMENT OF LIRR STAFF/SERVICE AREA
PARK
AVENUE
GCT DINING CONCOURSE
EXISTING NEA CROSS PASSAGEWAY BELOW
EXISTING 45TH STREET STEAM TUNNEL
46TH STREET
PROPOSED CROSS PASSAGEWAY BELOW (TYPICAL)
47TH STREET
EXISTING CROSS PASSAGEWAY ABOVE
48TH STREET
49TH STREET
LEGEND
▨ FUTURE EXPANSION (104,000 SF)
TERMINAL CONCOURSE AREA (183,000 SF)
● EXISTING ENTRANCES
● ESA - OPTION 2 ENTRANCES
0
100
200
SCALE IN FEET

Graphic by Parsons Brinckerhoff Quade & Douglas, Inc. /STV Incorporated

Figure 2-10

Proposed Mezzanine at Lower Level: Option 2



Graphic by Parsons Brinckerhoff Quade & Douglas, Inc. /STV Incorporated

SCALE IN FEET 0 10 20 30 40 50

LEGEND

- ▨ PROPOSED VERTICAL CIRCULATION
- ■ PROPOSED RETAIL/ AMENITIES
- ☐ UNEXCAVATED ROCK

M T A / L I R R
East Side Access

Figure 2-11
Longitudinal Section, Looking West: Option 2

Option 2: New Deeper Station in GCT

As described earlier, Option 2 would have 10 tracks at GCT, all approximately 77 feet below MNR's lower-level tracks. These would all be stub-ended tracks, so that trains would enter and exit on the same tracks. This deeper station would not need to use the loop track for departing trains because it would employ a wider "throat track" area than Option 1. The deeper station's throat track, where the 10 tracks combine to form two tracks, would not be constrained by the structure of GCT as would the throat track area in Option 1. This means the throat can be longer (1,800 feet versus 600 feet in Option 1) and trains can exit the terminal faster, supporting peak hour train operations without needing a loop track. After discharging and/or picking up passengers, all trains would reverse direction and depart the terminal to the north.

In the throat track area between 48th and 55th Streets, the 10 tracks would join together to form two tracks, and would continue north in two tunnels approximately 120 feet deep below Park Avenue (see Figures 2-14 and 2-15). At approximately 58th Street, the tunnels would gradually curve eastward, passing beneath the N and R and Nos. 4, 5, and 6 subway lines and joining the existing 63rd Street Tunnel at Second Avenue.

63RD STREET TUNNEL

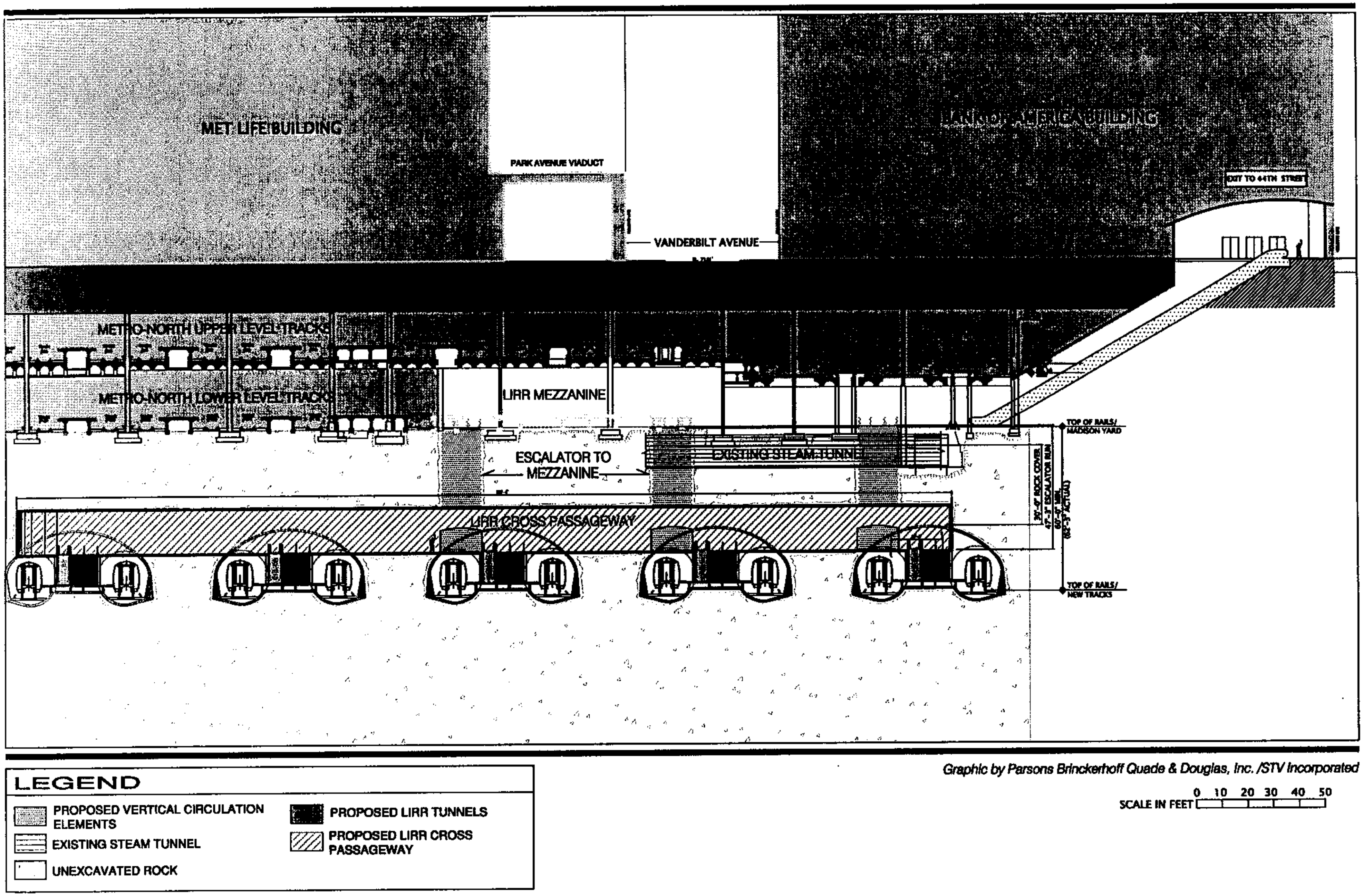
The 63rd Street Tunnel under the East River was constructed in the 1970's under the authority of the Metropolitan Transportation Authority. The tunnel was built with two levels, containing two tracks on the upper level for subway service between Manhattan and Queens and two tracks on a lower level for new LIRR service between East Midtown and Long Island. Subway service through the upper level of the completed 63rd Street Tunnel began in October 1989, when service on the B and Q lines was extended to 63rd Street and Lexington Avenue, Roosevelt Island, and 21st Street/Queensbridge. NYCT is currently extending this line approximately 1,500 feet farther to connect to the Queens Boulevard E, F, G, and R lines at Northern Boulevard (for more information, see the discussion of current planning context in Chapter 1, "Project Purpose and Need").

The lower level of the 63rd Street Tunnel remains unused. It extends in an easterly direction approximately 1.6 miles from a bulkhead at 63rd Street and Second Avenue in Manhattan, under the East River and Roosevelt Island, and into Queens, where it continues under 41st Avenue to a point west of Northern Boulevard. Just west of Northern Boulevard, the upper level of the tunnel (NYCT) branches away toward Northern Boulevard, but the lower level terminates there. East Side Access would run its new LIRR service through the currently unused lower level of the 63rd Street Tunnel.

QUEENS TRACK ALIGNMENT

EXISTING SUNNYSIDE TRAIN FACILITIES

As shown in Figure 2-16, the Sunnyside area of Queens is occupied by a vast railroad complex generally extending from close to Hunters Point Avenue on the west to 43rd Street on the east, between Northern Boulevard and Skillman Avenue. The railroad uses in Sunnyside are dominated by Sunnyside Yard, which is used by Amtrak and New Jersey Transit (NJ Transit) for storage and maintenance of trains. Sunnyside Yard includes extensive trackage for train storage with associated overhead electric wire (catenaries) and numerous buildings and parking areas for railroad employees. Amtrak stores trains throughout the day at Sunnyside Yard, while NJ



Graphic by Parsons Brinckerhoff Quade & Douglas, Inc. /STV Incorporated

Figure 2-12

Cross Section through 44th Street, Looking South: Option 2

rise to meet the upper level tracks, and north of 57th Street, four MNR tracks run under Park Avenue on one level.

In addition to the MNR tracks, several subway tracks are located along or near the project route. At East 53rd Street, the E and F line tunnels cross beneath Park Avenue and the MNR tunnel, on their route between the Lexington Avenue and Fifth Avenue stations. Also running east-west, the N and R line crosses the East Side of Manhattan at 60th Street (lower than the MNR tracks). Finally, the Lexington Avenue subway runs north-south directly below Lexington Avenue on two levels: the local No. 6 train is directly beneath the street, and the express Nos. 4 and 5 lines are beneath the local (see Figures 2-13, 2-14, and 2-15).

EAST SIDE ACCESS ROUTE

The new LIRR service in East Side Access's Preferred Alternative would travel north from GCT beneath the MNR tracks. The configuration of this route would be different under the two options under consideration.

Option 1: Station in Existing Lower Level of GCT

With a new station in the lower level of GCT, LIRR's tracks would be west of MNR, beneath existing buildings. This would enlarge the track area that lies beneath existing buildings on the west side of Park Avenue slightly: while today tracks are located beneath existing buildings as far north as 52nd Street, with East Side Access, they would be located beneath existing buildings as far north as 55th Street. Chapter 17, "Construction and Construction Impacts," discusses the complex construction that would be required to build these tunnels (including the underpinning of a number of Park Avenue buildings).

The 10 LIRR tracks would combine together to three tracks by 51st Street (see Figure 2-13). At the same time, they would gradually descend to new tunnels beneath MNR's tracks under Park Avenue. Trains on the eastern five LIRR tracks would reverse directions to leave GCT, traveling out of the station on the same tracks they arrived on. Trains on LIRR's western five tracks would do the same, or they would use the lower-level loop track, continuing forward on the loop track under GCT, and following the curving track around beneath the east side of Park Avenue, eventually rejoining the other LIRR tunnels east of Park Avenue. (After discharging their passengers, some of the morning peak period trains would exit, without passengers, via the loop track to travel to LIRR's Yard A in Sunnyside, Queens for midday storage, while other morning trains would travel to Yard A by reversing direction. Still other trains would carry passengers out to Long Island by reversing direction. Train storage and maintenance at Yard A is discussed later in this chapter in the description of the Preferred Alternative in Queens.)

At 53rd Street, the three main LIRR tracks would pass above the E and F subway lines, while the two loop tracks on the east side of Park Avenue would pass below them (see Figure 2-15). From 55th Street northward, the new LIRR service would travel in five tunnels beneath Park Avenue and beneath MNR's tracks. Beginning at about 58th Street the tunnels would gradually curve eastward and slope downward on their way to the 63rd Street Tunnel. All five tunnels would pass beneath the N and R subway lines at 60th Street and the No. 4, 5, and 6 subway lines at Lexington Avenue (between East 61st and East 62nd Streets). Between Third and Second Avenues, the five tunnels would merge into two tunnels and join the existing 63rd Street Tunnel just west of Second Avenue, approximately 140 feet below the street.

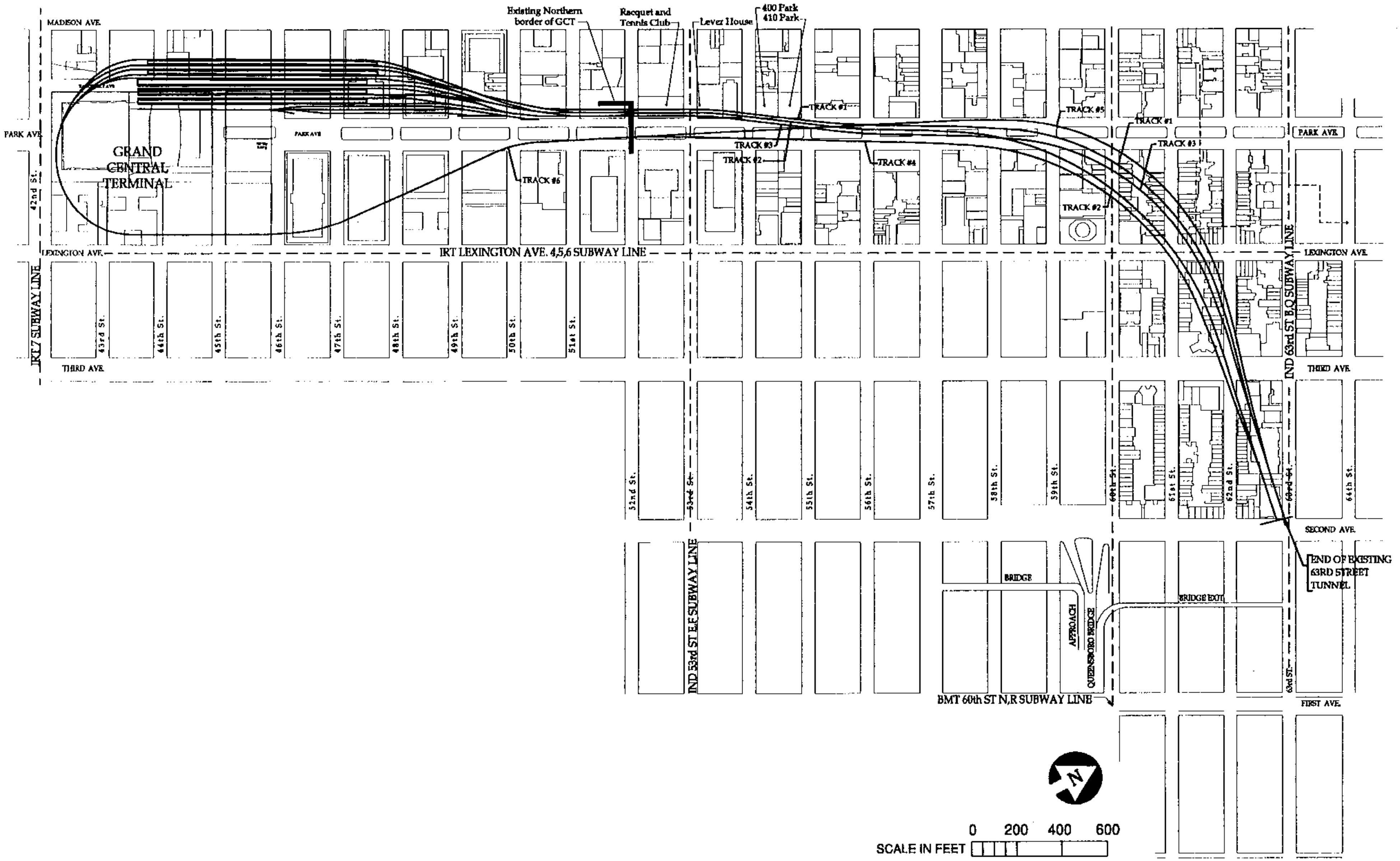


Figure 2-13

Manhattan Alignment: Option 1

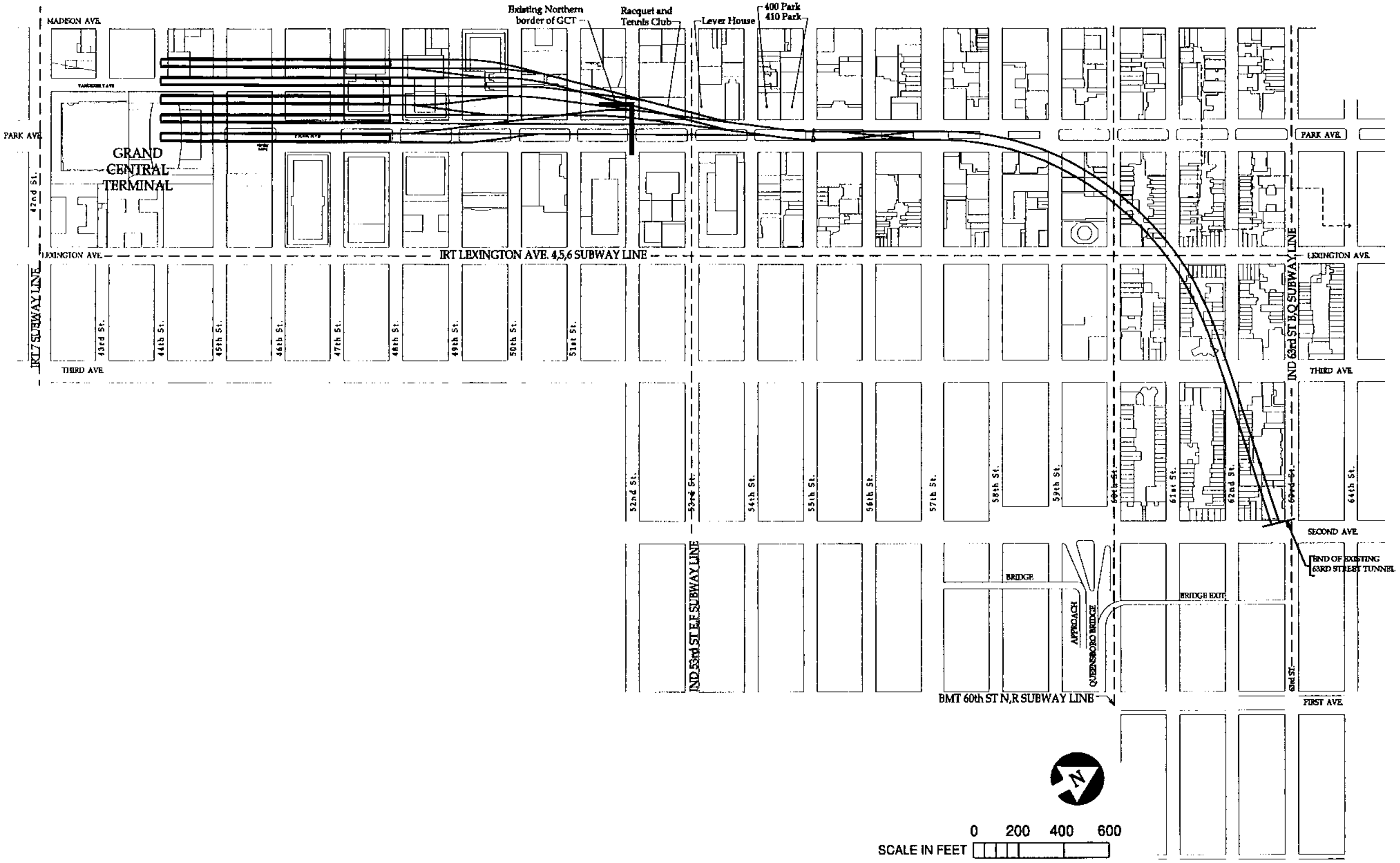


Figure 2-14

Manhattan Alignment: Option 2

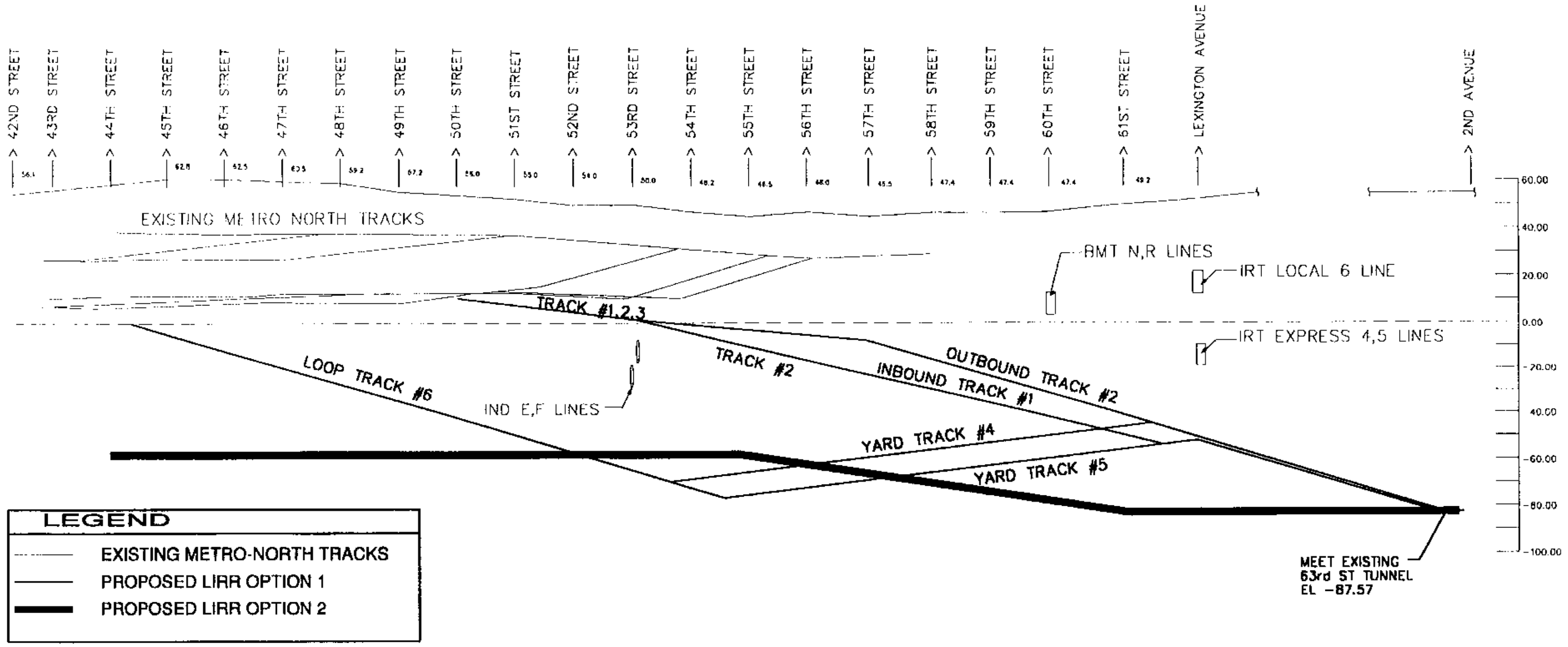


Figure 2-15

Manhattan Alignment Profile Looking West: Options 1 and 2

Transit uses the yard for midday storage of trains that have run inbound during the morning peak period and will run outbound during the evening.

Trains traveling east from Manhattan's Penn Station—including LIRR trains headed out to the Main Line and Port Washington, and Amtrak Northeast Corridor trains headed north to Boston—emerge from the East River tunnels along tracks adjacent to the southern boundary of Sunnyside Yard, just north of Skillman Avenue. These tracks also carry Amtrak and NJ Transit trains headed for Sunnyside Yard. Yard-bound trains use the Sunnyside Yard loop tracks, which are close to 43rd Street, to loop around into the yard.

The 1.5-mile stretch of track—and the associated switches and crossovers—shared by LIRR, Amtrak, and NJ Transit and providing access to and from the East River tunnels, Sunnyside Yard, LIRR's Main Line and Port Washington branch tracks, and Amtrak's route to and from New England over the Hell Gate Bridge is known as Harold Interlocking.

Adjacent to Sunnyside Yard on the north is a separate, smaller train yard owned by LIRR. This yard, known as Yard A, has numerous storage tracks that can be used by diesel-powered trains (the tracks are not electrified) and a 6,000-square-foot maintenance shop building with a paved parking area. Yard A is currently used by New York & Atlantic Railway (NYAR). NYAR runs freight operations on selected LIRR branches under a franchise agreement, and uses Yard A for storage and maintenance of freight cars. NYAR moves freight trains to and from Yard A over the LIRR's Montauk Branch, which connects to the western end of Yard A. The western end of Yard A also connects to NYAR's Arch Street Yard. The Arch Street Yard team track is a shared loading and unloading facility used by several of NYAR's freight customers, including Ringling Brothers and Barnum & Bailey circus, which uses the yard to store circus trains when it comes to New York.

Six bridges cross Sunnyside Yard, connecting the neighborhood on the north to that on the south: Hunters Point Avenue/49th Avenue, Thomson Avenue, Queens Boulevard, Honeywell Street and 39th Street. The Queens Boulevard Bridge carries vehicular traffic to and from Queens Plaza and the entrance to the Queensboro Bridge. It also carries the elevated No. 7 subway line across the yard between its stop at 33rd Street and Queens Boulevard and the Queensboro Plaza stop. Other subways nearby include the E, F, G, and R trains, which run beneath Northern Boulevard and stop at Queens Plaza. As described earlier, NYCT is currently extending the upper level of the 63rd Street Tunnel to the Queens Boulevard (E, F, G, and R) line, so that B and Q service can connect to Queens Boulevard, and E and F trains can be routed in the tunnel.

EAST SIDE ACCESS ROUTE IN QUEENS

Regardless of which Manhattan alignment option is chosen, East Side Access's Preferred Alternative would continue eastward from the lower level of the 63rd Street Tunnel to meet the LIRR's Main Line and Port Washington tracks in Harold Interlocking, just south and east of Sunnyside Yard. Two tracks would continue from the existing tunnel, run under Northern Boulevard (and beneath the E, F, G, and R subway lines that run under Northern Boulevard as well as the N train, which is elevated above), and then fan out under Yard A and Sunnyside Yard into five separate tunnels. After crossing beneath the railroad yards, the tracks would ascend, emerging from the five tunnels to join both the tracks at Harold Interlocking and the loop track (see Figure 2-17). Three of the five tracks would be for trains connecting to the Main

Line and Port Washington Branch tracks, while the other two would provide access to and from LIRR's Yard A (discussed below).

Construction activities associated with the Preferred Alternative would be closely coordinated with Amtrak operations to meet their requirements for access to and within Sunnyside Yard.

MIDDAY TRAIN STORAGE FACILITIES AT YARD A

With the new service provided by East Side Access, LIRR would need a yard for midday storage of the electric trains that serve GCT. Yard A at Sunnyside would be used for this midday storage, and for cleaning and light maintenance (see Figure 2-18). Trains would travel to Yard A from the 63rd Street Tunnel via one of the Sunnyside Yard loop tracks, which would be realigned to connect to Yard A. A fourth loop track would be added to the three existing tracks to accommodate LIRR trains. Most of the trains that bring passengers to GCT during the AM peak period on weekdays would be stored at Yard A during the day, waiting to return to GCT to pick up passengers departing during the evening peak period. A total of 24 trainsets would be stored in Yard A during the midday period. NYAR freight operations at Yard A would be relocated to other yards, as discussed below under "Replacement Maintenance and Storage Facilities."

During the midday, trains at the yard would be cleaned, serviced, and inspected. In addition to storage tracks, Yard A would have a Service and Inspection shop, a car wash facility, an extraordinary interior cleaning facility,* and various storage buildings. A new LIRR building adjacent to the yard at 2950-2970 Northern Boulevard (at approximately 41st Avenue) would house yard offices and crew quarters. This new building would be directly above the new tunnel.

NEW SUNNYSIDE STATION

In addition to the new service to GCT, East Side Access would also create a new station in Sunnyside, Queens. Selected LIRR trains bound to and from Penn Station would stop at this new station located below the Queens Boulevard bridge, which crosses over the LIRR Main Line tracks and Sunnyside Yard lead tracks. In the future, this station could also be used for Amtrak and/or NJ Transit service.

The new Sunnyside station would have one center-island and two side platforms that would be long enough for 12-car trains (see Figure 2-19). These three platforms would serve four tracks (two at the center platform and one each at the side platforms). The center platform would have two enclosed sheltered waiting areas.

The station's main entrance would be at street level on the west side of the Queens Boulevard bridge, directly above the center platform. The station building would open onto the west sidewalk of the Queens Boulevard bridge, and would house the LIRR ticket office, ticket vending machines, waiting room, and passenger information center, and potentially public restrooms and some retail space. Passengers would access the station platforms from this station building. The center platform would be accessible via stairs and an elevator, and the two side platforms would be accessed by pedestrian bridges over the tracks and enclosed stairways and elevator down to the platforms. The pedestrian bridge to the southern platform would also continue to a designated drop-off and pick-up area on the north side of Skillman Avenue, approximately 150 feet

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* Nightly cleaning includes sweeping and removal of debris; extraordinary cleaning includes hot-water mopping, and polishing and cleaning seat fabrics.

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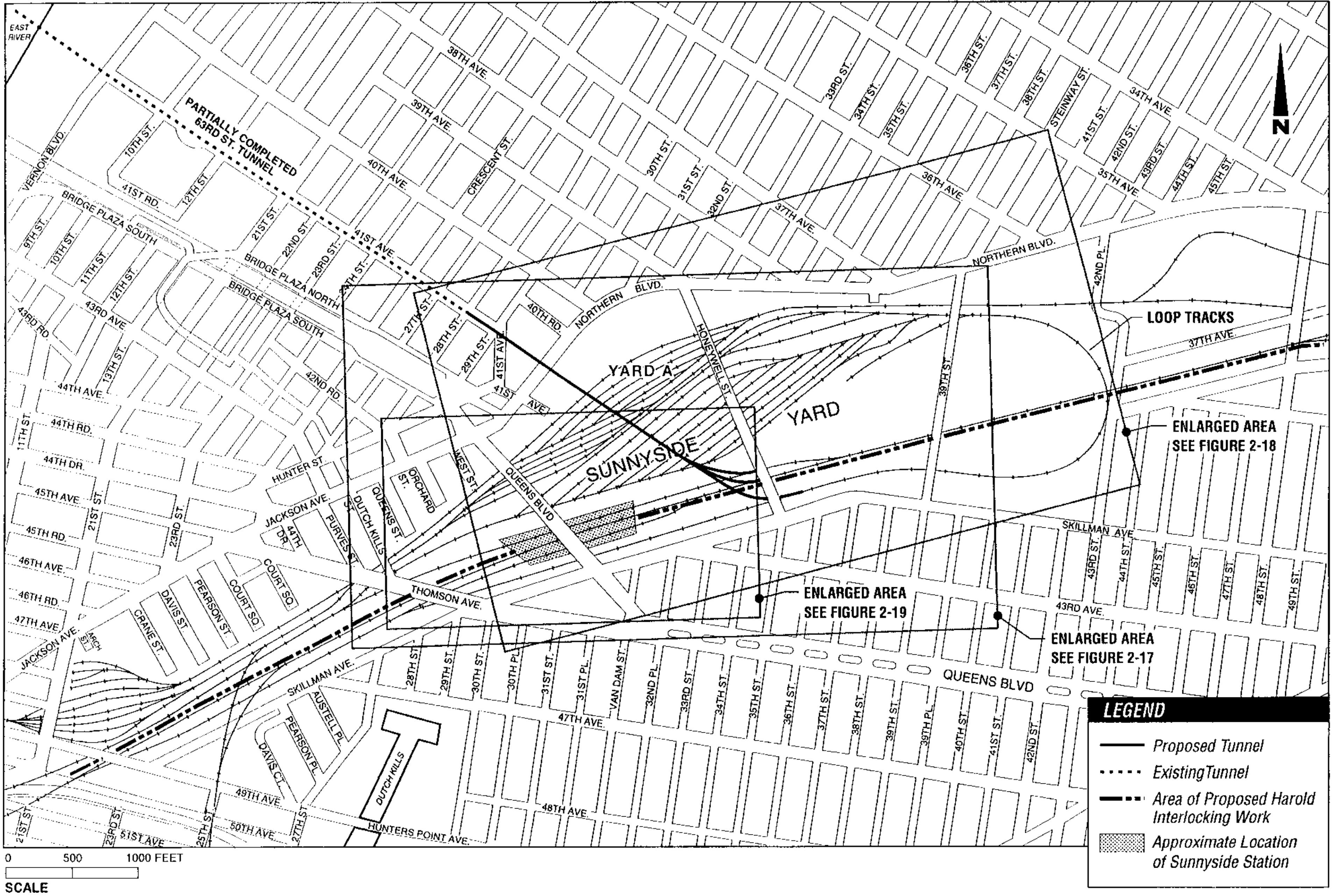
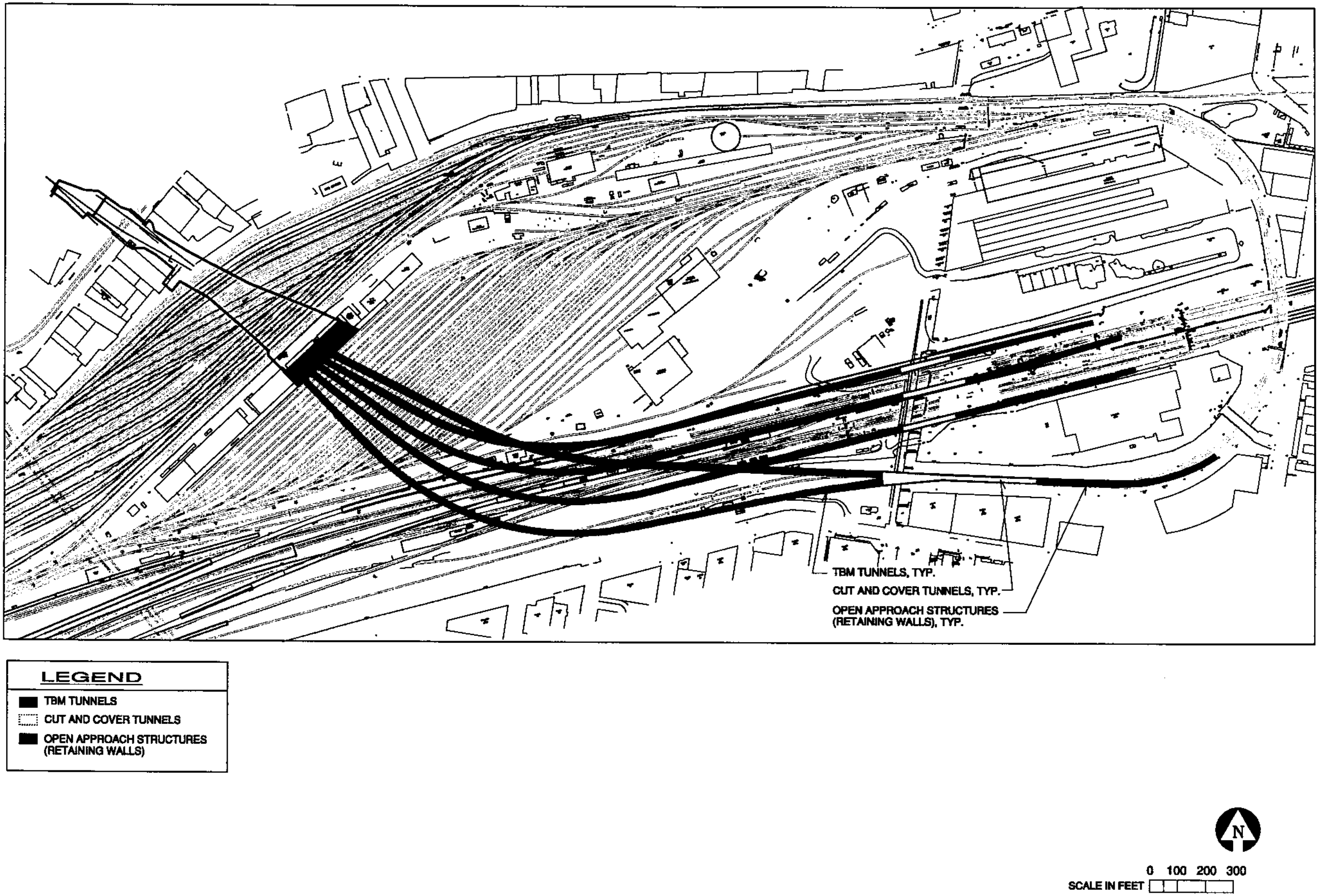


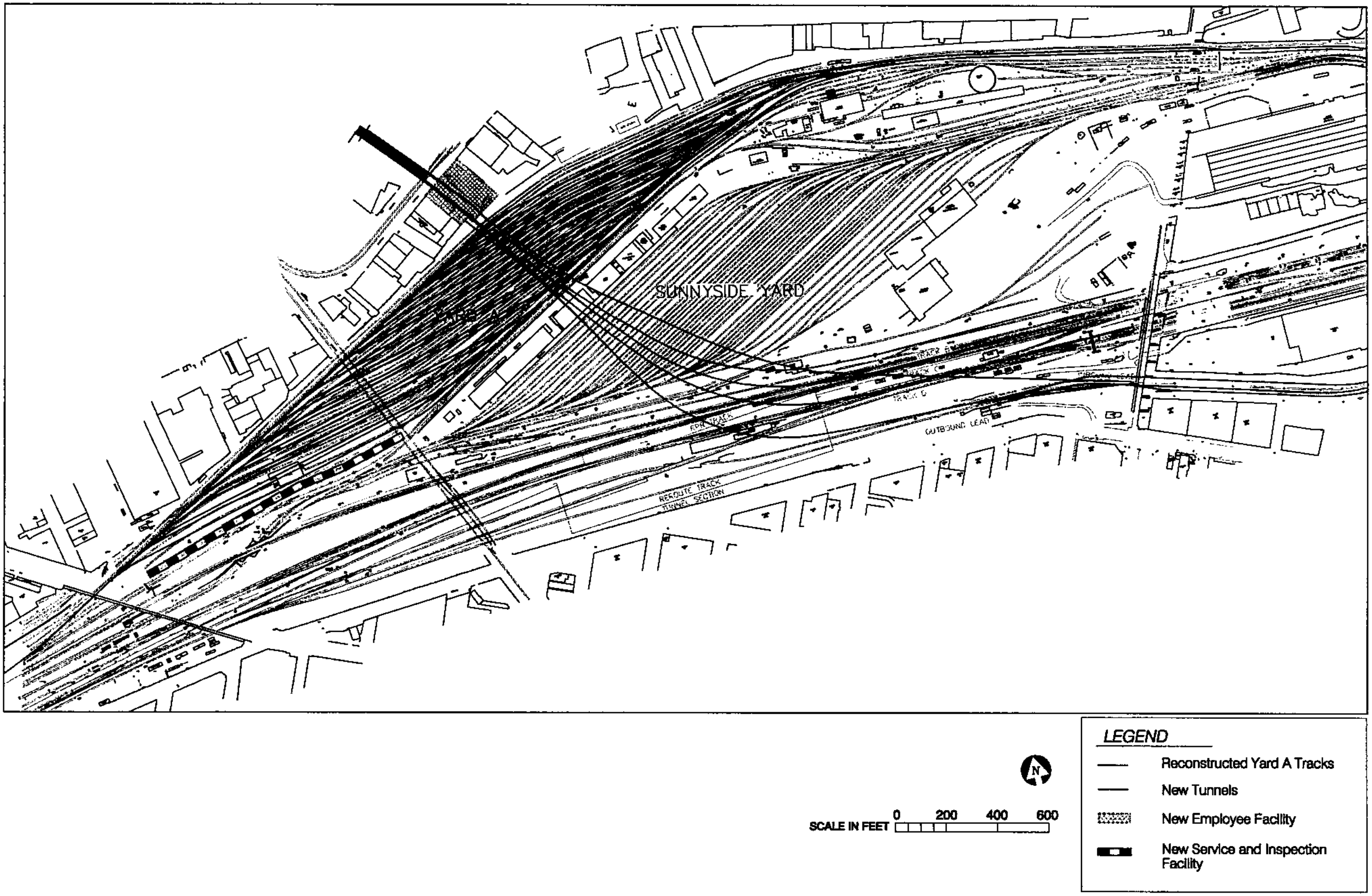
Figure 2-16

Project Elements in Sunnyside, Queens



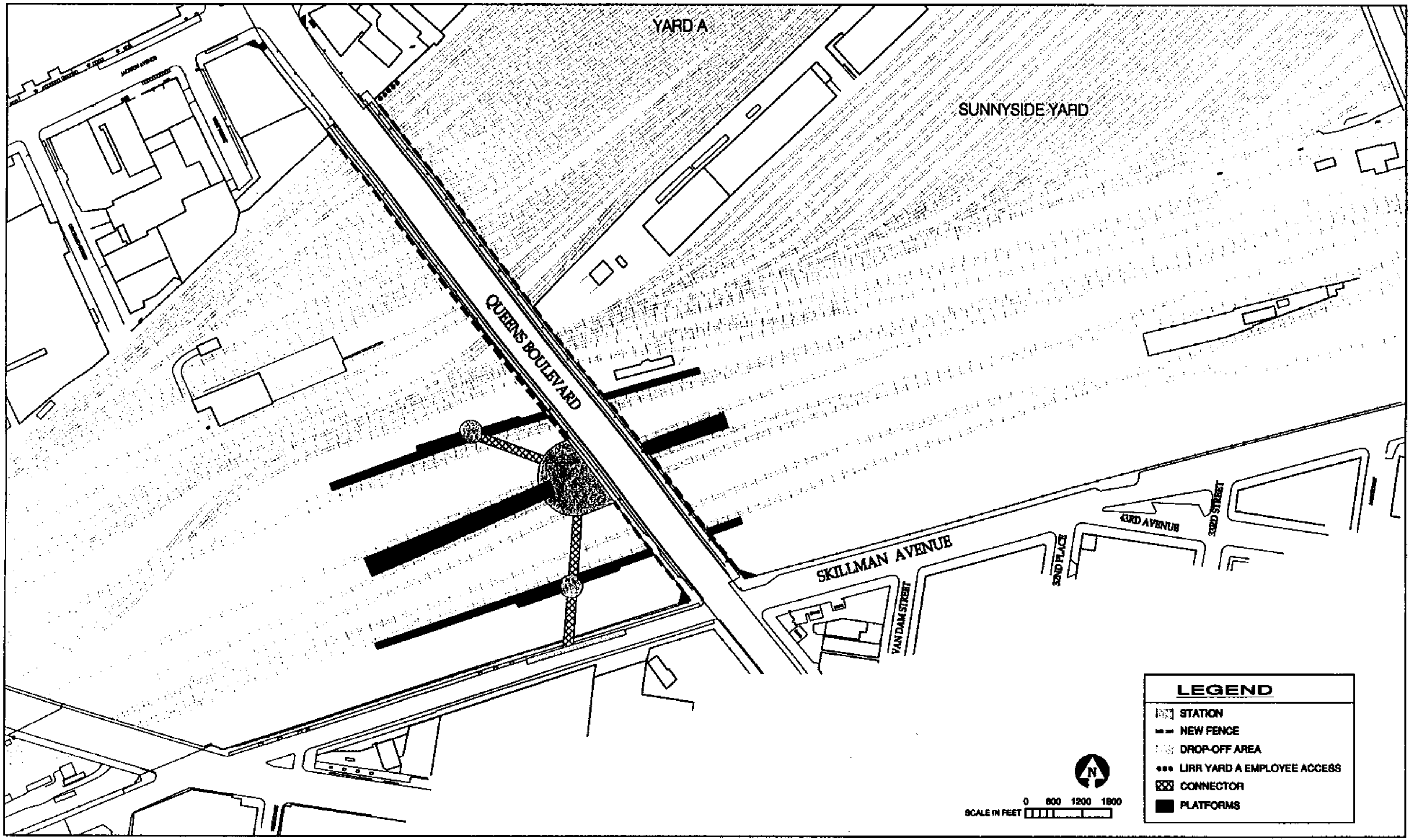
TBM TUNNELS, TYP.
CUT AND COVER TUNNELS, TYP.
OPEN APPROACH STRUCTURES (RETAINING WALLS), TYP.
LEGEND
TBM TUNNELS
CUT AND COVER TUNNELS
OPEN APPROACH STRUCTURES (RETAINING WALLS)
N
0 100 200 300
SCALE IN FEET

Figure 2-17
Queens Tunnels - Overall Plan



M T A / L I R R
East Side Access

Figure 2-18
Project Elements in Yard A



Graphic by Parson Brinckerhoff Quade + Douglas, Inc./STV Incorporated

Figure 2-19
Sunnyside Station Site Plan

west of Queens Boulevard. The drop-off and pick-up area would be located on Skillman Avenue to avoid traffic congestion along the busy Queens Boulevard viaduct.

EXTENSION OF NYCT LINES FROM EXISTING BELLMOUTH

In addition to extending the existing lower level of the 63rd Street Tunnel for LIRR use, two NYCT tracks from the upper level of the 63rd Street Tunnel would also be extended. The extension of these tracks, called T1A and T2A, would provide for a logical future connection to the planned NYCT storage yard in the vicinity of Sunnyside Yard. The tracks would be extended to a point to minimize future impact on LIRR operations, not precluding future expansion by NYCT.

HAROLD INTERLOCKING IMPROVEMENTS

The number and frequency of trains running through Harold Interlocking make it a congested area, especially during peak periods. Amtrak, LIRR, and NJ Transit movements leaving and entering the East River tunnels and Sunnyside Yard create conflicts that must be managed closely to avoid train delays. To avoid exacerbating this situation with additional LIRR service, East Side Access would make modifications to Harold Interlocking. These modifications would create the added capacity and flexibility required for construction and operation of the new LIRR service. As a consequence of these required improvements, it would also reduce existing operational conflicts.

The proposed work at Harold Interlocking would essentially separate the tracks used by Amtrak and the LIRR. When completed, Amtrak would travel on tracks separated from the LIRR Main Line, passing some sections of LIRR track in cuts and tunnels, and passing other sections on new track. New crossovers and switches would provide much greater operating flexibility for LIRR trains entering and leaving the East River tunnels. East of 43rd Street and just outside Sunnyside Yard, some new LIRR tracks would travel on a new viaduct structure beside the existing raised tracks until approximately 48th Street.

OTHER PROJECT COMPONENTS

SUBSTATIONS

Six electric substations, connected to local utilities, would supply electric power to LIRR trains serving GCT. Each substation would be located in an existing structure and/or underground, at the following locations:

- In existing GCT space between East 51st and 52nd Streets just west of Park Avenue in Manhattan.
- Beneath 54 Street west of Park Avenue in Manhattan.
- In the existing 63rd Street Tunnel ventilation shaft at 63rd Street and Second Avenue in Manhattan.
- In the existing 63rd Street Tunnel ventilation shaft and an adjacent new underground structure, between the seawall along Roosevelt Island's western East River shore and the roadway.

- In the existing 63rd Street Tunnel ventilation shaft in Queensbridge Park in Queens.
- At approximately 41st Avenue and Northern Boulevard in Queens.

VENTILATION

Ventilation plants would provide fresh air to East Side Access's tunnels and underground spaces, including passenger areas. The ventilation plants would also remove smoke in the event of a fire. During normal train operations, a continuous air path would be open from street level down to the tunnel. During a fire emergency or periods when trains had to stop in the tunnel, fans would be turned on to move air into and out of the tunnel. Since Option 1 and Option 2 would have different station layouts in GCT and different track alignments approaching GCT, these two options have different ventilation plans in Manhattan.

Manhattan Ventilation Plants

Option 1. Option 1, the station in the existing lower level at GCT, would create four ventilation plants in Manhattan, to ventilate the new LIRR trainshed in GCT, the tunnels under the west side of Park Avenue, the loop track under the east side of Park Avenue, and the approach to the 63rd Street Tunnel:

- At 47 East 44th Street, replacing an existing five-story building. This ventilation facility would serve the LIRR trainshed in GCT.
- Under East 54th Street between Park and Madison Avenues.
- Under East 54th Street between Park and Lexington Avenues.
- At Second Ave and East 63rd Street, within the existing 63rd Street Tunnel ventilation plant.

The below-grade ventilation facilities would be under the street, and would place gratings and street-level maintenance/exit hatches in the sidewalk. In addition, Option 1 would involve reconstruction work at the existing NYCT ventilation facility beneath 53rd Street between Park and Lexington Avenues.

Option 2. Option 2, the deeper station at GCT, would also have four ventilation plants, but two of them would be in different locations than in Option 1. (No ventilation would be required for loop track tunnels on the east side of Park Avenue, since this option would not use a loop track.) Option 2 would construct ventilation plants in the following locations:

- At 47 East 44th Street (similar to Option 1). Under Option 2, this plant would also include the mechanical equipment required to provide climate control for this option's new lower-level mezzanine.
- Within the lower level of GCT from 48th to 49th Streets.
- Under 55th Street between Park and Madison Avenues.
- At Second Avenue and 63rd Street (same as Option 1).

Roosevelt Island and Queens Vent Plants

On Roosevelt Island, an existing facility would be used to ventilate the lower level of the 63rd Street Tunnel. In Queens, one new ventilation facility would augment four existing 63rd Street Tunnel ventilation facilities (at 41st Avenue and Vernon Boulevard, 12th Street, 23rd Street, and 29th Street). The new East Side Access facility would be created beneath the LIRR's Yard A, on top of the new tunnel structure. The facility would extend from beneath the new LIRR Yard A building on Northern Boulevard across the width of Yard A.

REPLACEMENT MAINTENANCE AND STORAGE FACILITIES

As described in the discussion of the Preferred Alternative above, East Side Access would displace existing rail activities from Madison Yard at GCT and from Yard A at Sunnyside. New replacement rail yards would be provided for both MNR and NYAR.

RELOCATION OF METRO-NORTH TO HIGHBRIDGE YARD

The new East Side Access facilities at GCT would occupy Madison Yard, an area currently used by MNR for midday storage, light maintenance, and cleaning. Both options under consideration would displace Madison Yard: Option 1 would use the space for its platforms and tracks, while Option 2 would use this area for the LIRR's mezzanine.

To replace Madison Yard, East Side Access would create new midday storage tracks and maintenance facilities for MNR trains at Highbridge Yard, in the Bronx. Highbridge Yard had been previously selected by MNR as a preferred location for future midday storage of trains. The new facilities, on land currently owned by Metro-North, would be sufficient to meet MNR's projected needs through 2020.

Currently, Highbridge Yard is a partially used rail yard located on the eastern shore of the Harlem River north of Macombs Dam Bridge and south of High Bridge. Specifically, the yard extends from the equivalent of West 161st Street on the south to Depot Place (about 169th Street) on the north. The yard has limited tracks, located between the Harlem River and MNR's Hudson Line tracks. The Oak Point Link freight line runs adjacent to the yard as well. MNR currently uses the approximately 20-acre yard for storage and construction staging.

A number of improvements to Highbridge Yard would be made to replicate operations currently conducted at Madison Yard. The new Highbridge Yard complex would include the following:

- A storage yard for storage and servicing of electric trainsets. This yard would have six tracks, with the capacity to store up to 11 electric trainsets during the midday. In total, the new Highbridge Yard facility would have the capacity to store approximately 90 train cars, sufficient to handle MNR's projected need.
- Two runaround tracks (east and west) and new lead tracks at the north ends of the yard to allow connections from both directions.
- A Car Appearance Facility, consisting of a 900-foot-long building covering two tracks. This facility would be used for periodic cleaning and repair of the interiors of MNR trains.
- Two employee station platforms with an enclosed overpass.
- Employee automobile parking.
- A materials storage area.
- New fencing and pole-mounted lighting.

In a separate endeavor, the Oak Point Link freight line would be relocated to the west side of the yard along the edge of the Harlem River prior to the reconstruction of Highbridge Yard.

The overall plan for Highbridge Yard also includes additional elements that would not be constructed as part of the Preferred Alternative, such as an enclosed train washer facility and various tracks and servicing facilities for diesel trains. Because these facilities are not part of the existing Madison Yard, they are not included as components of the new Highbridge Yard replacement facilities of the Preferred Alternative.

RELOCATION OF NEW YORK & ATLANTIC RAILWAY

The new East Side Access service would also displace NYAR's operations from Yard A in Sunnyside. As described earlier, NYAR currently uses Yard A as a rail car storage and maintenance facility. With new service to GCT, the LIRR would use all of Yard A for midday storage and maintenance of LIRR trains that serve GCT. The Preferred Alternative calls for the relocation of NYAR operations from Yard A to two of three replacement rail yards, all located in Queens adjacent to the LIRR Montauk Branch tracks. NYAR would be provided with replacement railcar storage tracks for a minimum of 61 cars (or 3,500 feet of storage track) at either Blissville or Maspeth Yard and a replacement railcar maintenance shop, most likely at Fresh Pond Yard.

Blissville Yard

Blissville Yard is located in Blissville, Queens, less than a mile from Yard A. It is just north of Newtown Creek and east of Dutch Kills (see Figure 2-20). Currently unused, Blissville Yard is being considered as a possible location for replacement rail car storage. Four to six unelectrified storage tracks would have to be constructed, each approximately 1,400 feet in length (to provide a minimum of 3,485 feet of storage track), to store 80 to 90 freight cars. In addition, two hand thrown switches, one each at the east and west ends of the yard, would be installed connecting the yard to the Montauk Branch, along with security fencing and pole-mounted lighting.

Maspeth Yard

Maspeth Yard is located in Maspeth, Queens, approximately 1½ miles east of Blissville Yard adjacent to the Montauk Branch LIRR tracks. The yard runs along Rust Road near the intersection with Maspeth Avenue. Maspeth Yard is an active rail yard, currently used by NYAR as a storage facility and staging area for freight cars hauling debris removed from the Third Water Tunnel construction project. The four storage tracks at the yard connect to the Montauk Branch mainline tracks at the east end of the yard. A former connection at the west end of the yard was removed several years ago.

Like Blissville Yard, Maspeth Yard is being considered as a possible location for replacement rail car storage. Four additional storage tracks would have to be constructed, each approximately 1,400 feet long, between the existing northerly yard track and the Montauk Branch tracks (see Figure 2-21). In addition, a hand-thrown crossover connecting the west end of the yard to the Montauk Branch would also be installed.

Fresh Pond Yard

Fresh Pond Yard and Junction are located in Glendale, Queens, at the intersection of the LIRR's Montauk Branch and the Conrail freight tracks, approximately three miles east of Maspeth Yard. Fresh Pond Yard consists of a west yard and an east yard, divided by the Conrail bridge. Fresh Pond Yard is the major freight facility on the NYAR/LIRR system; the location where NYAR receives cars from Conrail's Oak Point Yard in the Bronx, which receives freight from the entire

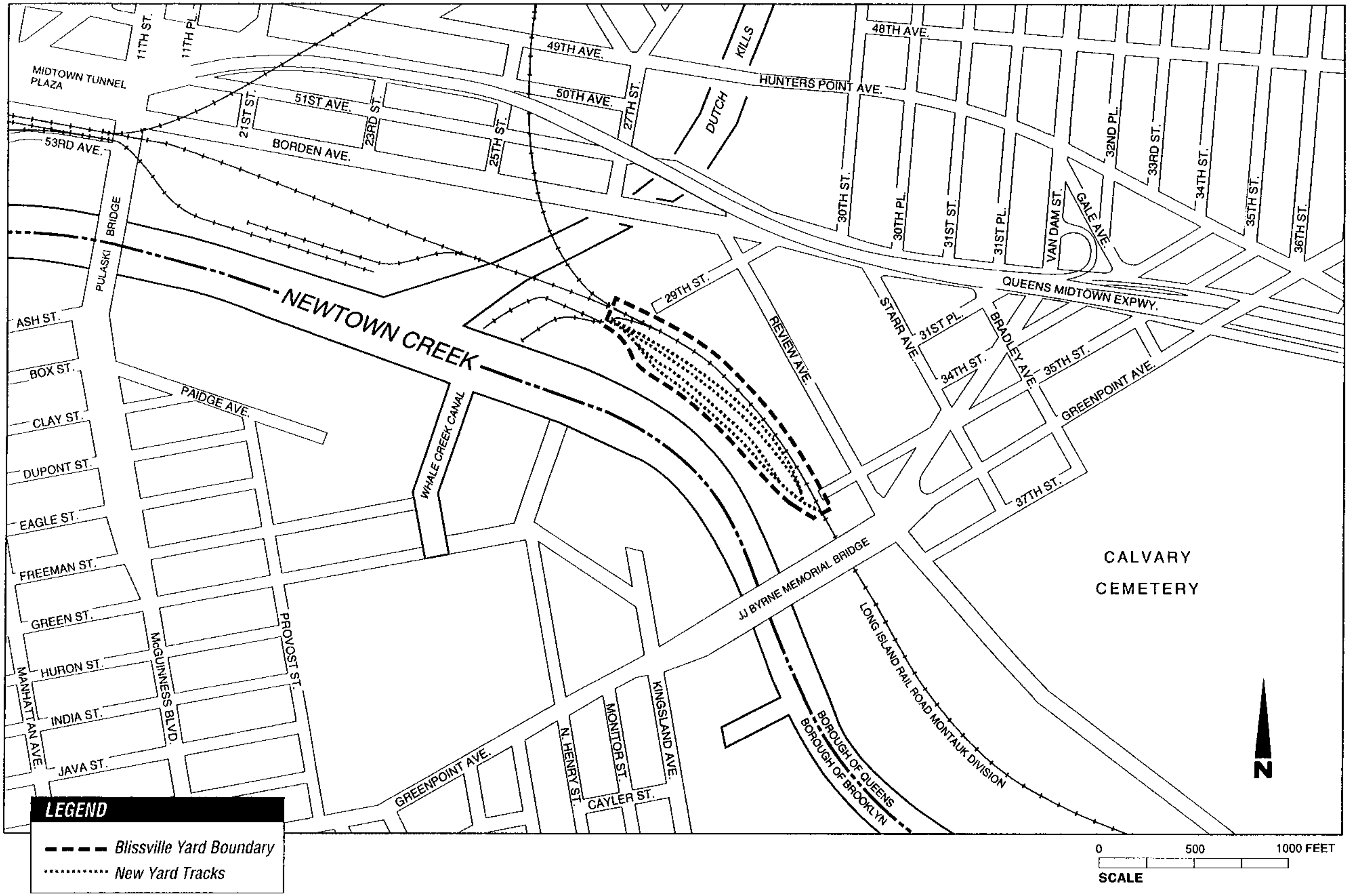


Figure 2-20

New Blissville Yard Facilities

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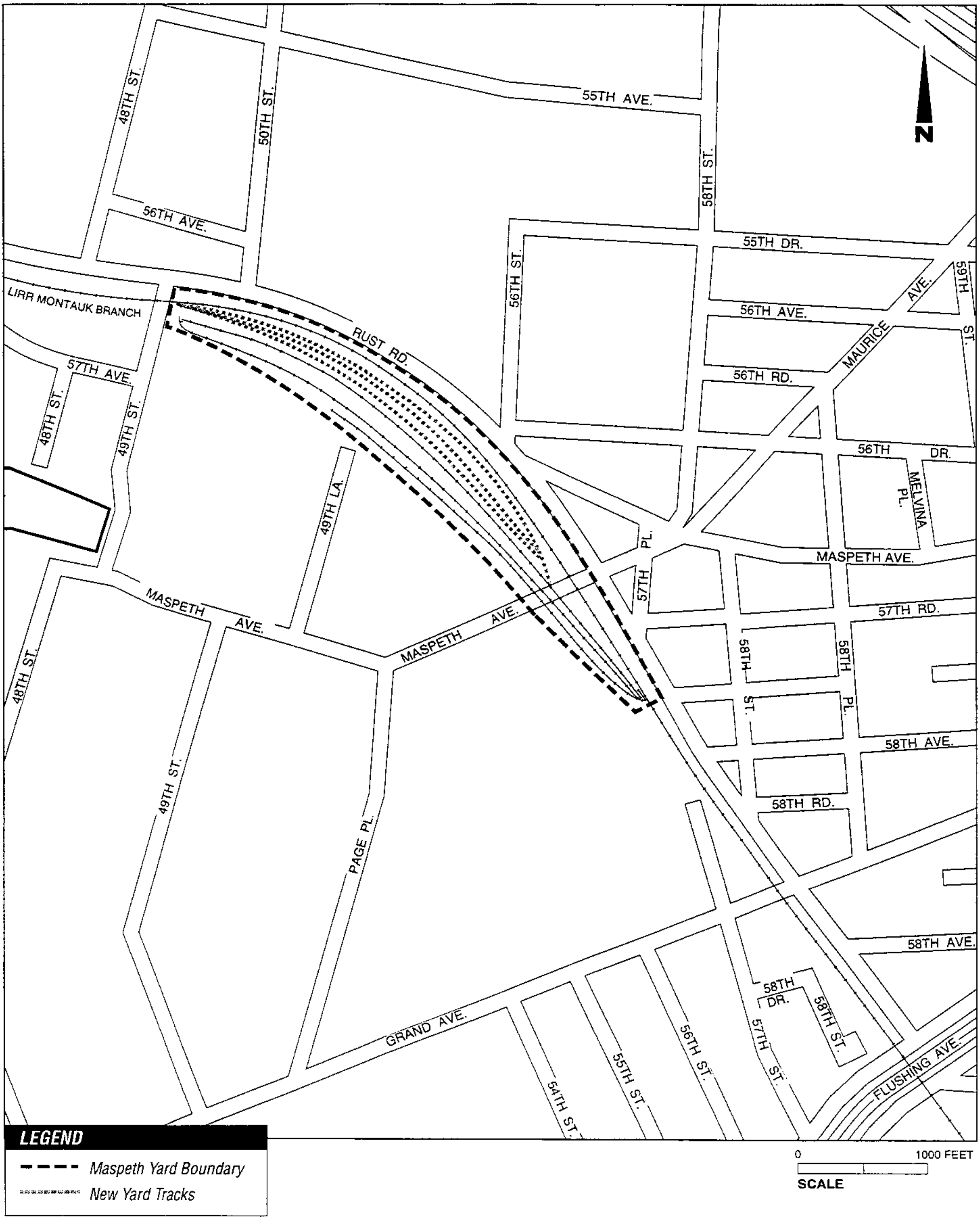

Figure 2-21

New Maspeth Yard Facilities

country. NYAR marshals the freight cars at Fresh Pond, and uses the yard for storage as well. NYAR's headquarter offices are also located in a trailer in Fresh Pond Yard.

The yard is being considered as a location for the replacement maintenance shop, which would be sited at the current location of NYAR's headquarters in the center of the east yard (see Figure 2-22). The new maintenance shop would include the following components:

COSTS

Capital costs take into account only the costs associated with the system improvements required for each option of the Preferred Alternative. As outlined in Table 2-2, capital costs for the Preferred Alternative are estimated at $4.7 billion for Option 1 and $4.3 billion for Option 2. Total capital costs include costs of construction, costs for engineering and management, costs to purchase additional rolling stock (220 new M-7 rail cars), and costs for property acquisitions and easements required for the project.

Table 2-2

Capital Cost Estimates: Preferred Alternative Option 1 and Option 2

Component	Option 1 Cost (in millions)	Option 2 Cost (in millions)
Construction, Engineering, and Management	3,521.4	3,288.6
Right-of-way	400.0	265.0
Rolling Stock	790.5	790.5
Total ESA Capital Costs	**4,711.9**	**4,344.1**

Notes: The above table reflects the costs of the Preferred Alternative. Other improvements that benefit operations for LIRR and Amtrak and also benefit East Side Access could also be built while the Preferred Alternative is under construction. Funding for those items, which include a westbound bypass at Harold Interlocking, an additional loop track and associated tunnel and retaining wall, and extensions of MTA NYCT tunnel structures, would be funded by the agencies that most directly benefit from the improvements and not as part of the total ESA capital costs.

Costs are escalated to midpoint of construction.

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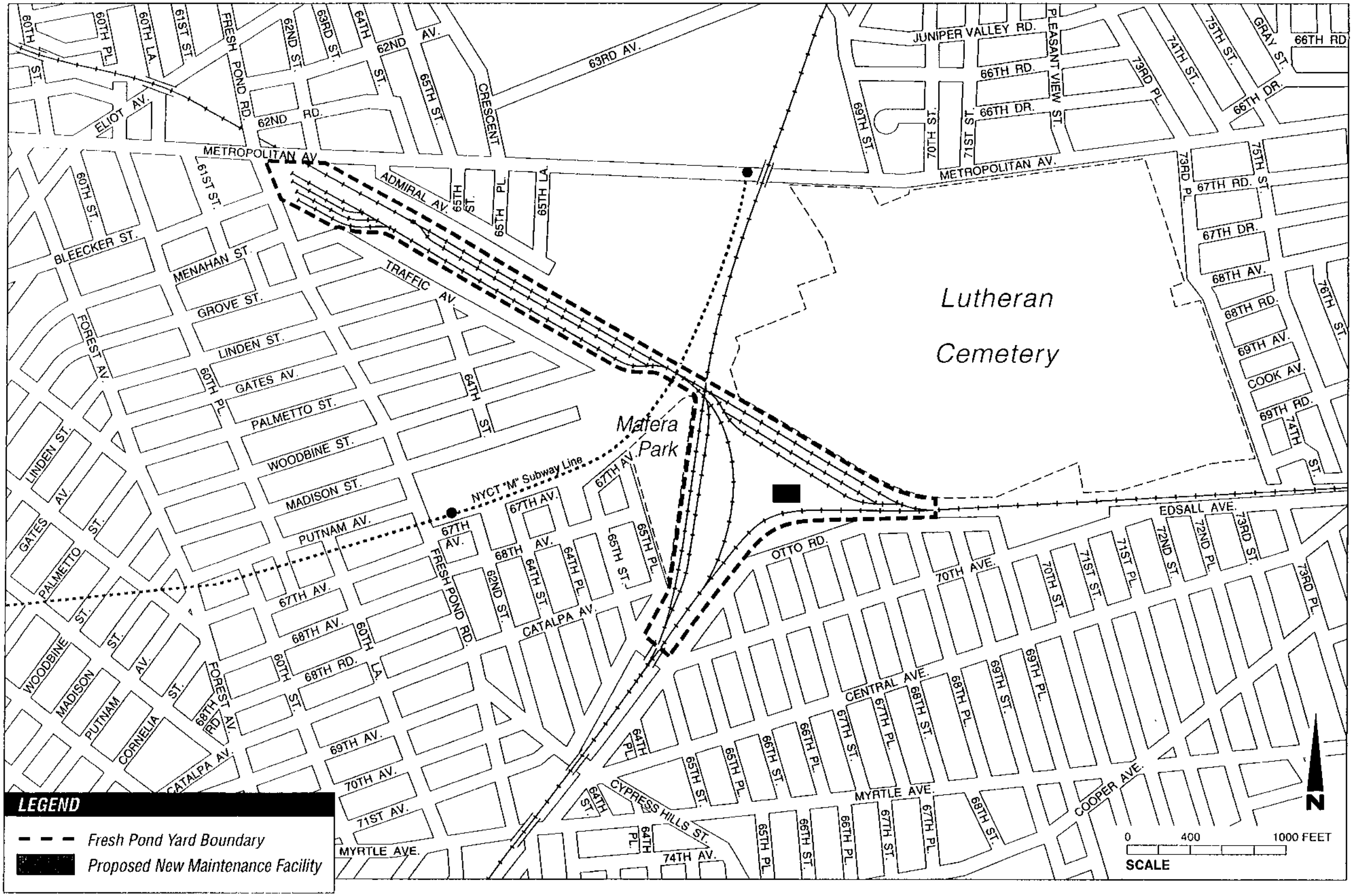

Figure 2-22

New Fresh Pond Yard Facility

Chapter 3: Land Use, Zoning, and Public Policy

A. INTRODUCTION

This chapter examines the project's potential for impacts related to land use, zoning, and public policy. Regionally, transit access is often a powerful determinant of land use trends. The project could also affect land use locally by bringing more people to an area or changing the way certain train yards are used. Land use issues for this project include the potential for project alternatives to alter local land uses or influence neighborhood or regional land use patterns. Project alternatives may also support or contradict land use plans and policies. For study areas in Manhattan, Queens, Long Island and the Bronx, this chapter analyzes existing land use, zoning, and public policy; estimates future background conditions common to all alternatives in 2010 and 2020; and identifies and addresses potential impacts on land use, zoning, and public policy associated with the project alternatives.

The geographic scope of the project and the variety of activities it will engender require that the analysis consider several study areas and subareas, as follows:

- Long Island Transportation Corridor (LITC). This regional study area frames the basic Long Island Rail Road (LIRR) service area, which includes Manhattan, Queens, and Brooklyn, and Nassau and Suffolk Counties. Although residents of other parts of the New York region use the LIRR, their numbers are very small; the LITC contains the entire LIRR network of stations, routes and yards, and the vast majority of LIRR passengers.
- Manhattan Land Use Study Area. The vast majority of LIRR users heading to and from Manhattan start or finish their trips in the area south of approximately West 70th and East 79th Streets. In this area, the analysis addresses the compatibility of the proposed project's service changes and new terminal with established and potential future development and public policy initiatives. Local effects on land use near Grand Central Terminal (GCT) and Penn Station are also addressed. Because this area is large and varied, it is further divided into 11 neighborhood subareas (see Figure 3-1).
- Queens Land Use Study Area. The greatest influence on land use in Queens is the potential effect of the proposed new station in Sunnyside. Therefore, a land use study area was defined within a half-mile radius of the station. The half-mile distance represents a reasonable walk to the station and thus defines the location of greatest influence of a new rail station. The analysis focuses on the new station's compatibility with and effect on established and potential future development and public policy.
- Yard Land Use Study Areas. Because New York & Atlantic Railway's (NYAR) freight operations would be displaced from Yard A under the Preferred Alternative, three potential relocation sites are being considered: Blissville Yard, Maspeth Yard, and Fresh Pond Yard, all in Queens. In addition, the use of the lower level of GCT for LIRR trains will require relocation of Metro-North Railroad's (MNR) midday train storage area to MNR's Highbridge Yard in the Bronx. The areas surrounding each of these yards have been examined

for potential land use impacts. Each land use study area is defined by an approximately 400-foot radius from the edge of the yard. Within these areas, detailed field surveys were conducted, focusing in particular on identifying any land uses that might be sensitive to changes in freight activities at the yards—such as residential uses, for example.

In addition to these areas, the project may affect land use and various neighborhood conditions in the vicinity of the tunnel alignment and other work areas during construction. Study areas have been defined along the proposed tunnel alignments and construction access and staging locations in Manhattan and Queens. Existing and future background conditions in these areas have also been assessed. These are presented and potential impacts are addressed in Chapter 17, "Construction and Construction Impacts."

In addressing potential land use impacts of the project, certain land use study areas were considered, but ultimately NOT included in the analysis. Because the project would shift patronage among LIRR terminal stations, consideration was given to establishing land use study areas for each terminal. The patronage analysis (see Chapter 9, "Transportation") found that the number of LIRR commuters entering Penn Station in the AM peak period would decrease by 42 percent by 2010. As noted above, the effect of this change is addressed within the assessment of the Manhattan study area. The patronage analysis also found major decreases in patronage at the Hunterspoint Avenue and Long Island City stations in Queens. However, this reduction would affect only transfers between the LIRR and New York City Transit's (NYCT) No. 7 train to Manhattan's East Side, since the vast majority of LIRR riders who use these stations do so to connect to the subway. Since this change is internal—virtually all of the affected passengers now move from one station to the other without venturing into the neighborhood—no effect on land use patterns, zoning, or public policy is anticipated. Finally, patronage at Flatbush Avenue in Brooklyn is predicted to be only marginally affected by the project. Thus it is not necessary to consider a Brooklyn study area in this land use chapter.

B. HISTORY OF TRANSPORTATION AND LAND USE PATTERNS

THE LIRR AND LONG ISLAND

Although the LIRR is now the largest commuter railroad in the country, it was originally built to shorten trips between New York and Boston. Passengers traveled from Brooklyn to Greenport and took a ferry to Connecticut, where they boarded another train to Boston. Given this purpose, it was sensible to construct the line through the sparsely populated center of the island—where land was either undeveloped or in agricultural use—rather than along the shoreline, where population was centered and where towns and villages had been established. The rail line's remote location was a benefit, as there were no centers of development or substantial populations to impede construction. Construction proceeded eastward in stages, beginning with the link from Brooklyn to Jamaica (completed in 1834) and culminating in the final phase to Greenport in 1844.

When it opened, the railroad offered the most direct and reliable means of travel to Boston. But just a few years later, in 1850, the LIRR, outdone by the opening of the New York, New Haven, and Hartford all-rail link to Boston along the southern New England coast, had to declare bankruptcy. However, this event coincided with the rise of rail transit as a regional service. Very quickly, it became clear that railroads offered high-speed transportation service between localities, greatly enhanced the delivery of raw materials and goods, and were key to opening up areas for new development. Throughout Long Island, the LIRR and other providers began to build rail lines in coordination with burgeoning development. For example, in the 1860's when Alexander Turney Stewart purchased 500 acres from the Town of Hempstead to build a model village (now Garden City) just west of the existing LIRR branch connecting Mineola and Hempstead, he saw rail service as essential to his development. When he could not make a satisfactory arrangement with the LIRR, he had the rival Central Railroad Company build a line from Flushing to Floral Park, and then through the center of the proposed new village to Bethpage, with a small spur to Farmingdale, and another spur to Hempstead, running about one block east and roughly parallel to the LIRR's Hempstead Branch from Mineola.

By the end of the Civil War, intense rivalries grew between the LIRR and other rail operators who had built lines in support of new and established development. Over time, however, all these lines were consolidated into the LIRR. The network of rail lines traversing Long Island continued to encourage new growth and expansion of existing villages along its length. In 1910 the LIRR was finally connected directly to Manhattan, when tunnels under the East River were completed. The link to Pennsylvania Station (see discussion below) on Manhattan's west side made travel faster and more convenient and supported the growth both of Long Island's residential communities and of Manhattan as the region's premier employment center.

The influence of the LIRR on Long Island development remained strong through the first half of the 20th century, but began to wane after World War II. The rise of automobile ownership and construction of the interstate and other highway systems throughout the country and on Long Island led to more widespread development. Town centers were still important, and LIRR was still a major attraction for the island's new residents, but the population and economy were no longer absolutely dependent on the railroad for transportation of people, goods, and materials. In this era, Nassau County saw enormous growth as prosperity allowed families to leave the cities and move to suburban homes. The growth trend continued to move eastward into Suffolk County as well.

World War II had also established Long Island as an employment center (major defense facilities were built in Lake Success, Bethpage, and Riverhead, for example), and although these employers have been greatly diminished in recent years, they have been replaced by other businesses, including the computer industry. Today, all but the most easterly portions of Long Island are suburbanized, with a mix of development that is well-served by commuter rail, but that also relies on a network of roads and highways for the majority of trips.

PENN STATION, GRAND CENTRAL TERMINAL, AND MANHATTAN

THE GREAT TERMINALS

The first Penn Station and the GCT that exists today were built in the same era, in response to a nationwide trend in railroad travel. The industrial revolution after the Civil War, the growth of the country's cities as major population and economic centers, and the rise of a prosperous middle class combined to make rail service key to a strong national economy. In the pre-car-and-truck era, the railroad was the most efficient form of transportation for nearly everything: long distance travel; travel to and from work; local, regional, and national movement of goods and raw materials; and vacation travel. In addition, the technical innovations in tunnel construction and in the use of electrical power permitted the introduction of large terminals into center cities without the disruption that rail facilities had previously caused. Most of the unsightly, dangerous, and land-consuming facilities could be concealed underground.

Reflecting the importance of rail travel, both terminals were conceived as extraordinary "gateways" to New York City. The quality of architecture and convenience to passengers distinguished the design. There was also an expectation that both terminals would spur development and the orderly progress of the city. From this point of view, construction of GCT was more successful than that of Penn Station, as discussed below.

Penn Station

The idea for Penn Station began in 1900, when the Pennsylvania Railroad (PRR) bought a majority interest in the LIRR. PRR was now in a position to offer train service from the tip of Long Island to Philadelphia and beyond. Beginning in 1903 the railroad dug tunnels under the Hudson and East Rivers, developed the Sunnyside Yard in Queens, electrified the service through and near Manhattan, and built Penn Station. The work was completed in 1910. Penn Station, designed by McKim, Mead & White and covering the area from 31st to 33rd Street, Seventh to Eighth Avenue, was an architectural triumph. A companion building, using the same architects, was built for the General Post Office in 1913 just west of the station, between Eighth and Ninth Avenues. The railroad also developed a large hotel facing the station across Seventh Avenue. Together, these buildings were expected to foster a new civic center in West Midtown (Stern, et. al., 1983).

However, aside from these three buildings, the railroad did not control the surrounding neighborhoods. Penn Station and the General Post Office were located at the southeasterly end of Hell's Kitchen and the northwesterly end of the Tenderloin District. Considered a slum, the Hell's Kitchen neighborhood provided low-cost housing for the immigrants who worked in the nearby slaughterhouses, warehouses, lumberyards, and factories. The Tenderloin contained the city's theater, entertainment, and shopping district, intermixed with row houses, tenements, and a reputation for substantial criminal activity. Each neighborhood operated with a successful economy, and neither was likely to change without major public or private investment.

Over time, the area surrounding Penn Station did change. The entertainment and shopping districts moved northward—theater to Times Square, shopping to Herald Square and Fifth Avenue—and the garment industry began to dominate the area that had been the Tenderloin. Construction of the Lincoln Tunnel and its approach ramps in the 1920's and 1930's removed many of the tenements and factories in the southern end of Hell's Kitchen. By the beginning of the post-World War II era, Penn Station's presence in the southwestern corner of Midtown had done little to change its surroundings. In 1962, primarily for financial reasons, the railroad sold Penn Station for a joint development project. The station was torn down and replaced by a new Madison Square Garden and Two Penn Plaza, a large (1.5 million-square-foot) office building. At about the same time, the Greyhound bus terminal just north of the station was razed to make way for One Penn Plaza, a 2 million-square-foot office building. This effort established a node of office space surrounding the station, but it took another 20 years—until the boom of the 1980's—to establish the Penn Station area as an office district. Today, many of the loft and garment industry showroom buildings have been converted to office use, from approximately 28th Street to 40th Street along Seventh Avenue and Broadway.

Grand Central Terminal

The roots of GCT's relationship with surrounding development go back to the 1860's, when Cornelius Vanderbilt took control of the New York and Harlem Railroad, the New York and New Haven Railroad, and the Hudson River Railroad. All of these lines crossed from the mainland into Manhattan with terminals on the east and west sides. Vanderbilt decided to build a coordinated terminal at 42nd Street, the most southerly point in which steam locomotives were permitted in Manhattan, on a site at Fourth Avenue that already contained a number of railroad buildings. As part of his plan, he brought all the tracks together at a new yard in Mott Haven (in the Bronx) and acquired more land for storage and marshaling yards between Madison and Lexington Avenues from 42nd to 48th Street. The terminal, known as Grand Central Depot, was completed in 1871 and was immediately followed by the Fourth Avenue Improvement Scheme, which lowered the tracks on Fourth Avenue below street level to 56th Street, placed them in a tunnel from 56th to 96th Streets, and constructed the viaduct north of 96th Street. Above the tunnel, the project developed a landscaped median strip (really intended to mask the smoke emanating through vents from below), thus creating Park Avenue.

In the three decades following construction of Vanderbilt's depot, the New York Central grew rapidly, so that by the early years of the 20th century, the railroad was planning a new terminal. This time, however, the scheme was truly comprehensive. It involved (1) electrifying the railroad to Mott Haven, (2) covering all of the tracks and creating a new Park Avenue south of 56th Street, (3) routing Park Avenue around the terminal, using a built-in viaduct and ramps, and (4) using air rights to create revenue-producing development above the railroad's property between Madison and Lexington Avenues, 42nd and 50th Streets. This last item was the first application of an approach that has now been used the world over to finance infrastructure projects with revenues from related development. And it is the main reason for the difference between development at GCT and that at Penn Station.

Within 15 years, the area closest to GCT contained substantial office development (for example, the Chrysler building, the Graybar building, the New York Central building astride Park Avenue), several hotels, and institutional uses, such as the Yale Club. Moving northward, Park Avenue had emerged as one of the city's most prestigious residential districts. All available air rights had been taken by luxury apartments and hotels. This spurred similar development farther north along the avenue to 96th Street. After World War II, most of the apartments south of 59th Street began to be redeveloped for first-class office use, and this portion of Park Avenue became the spine for the most desirable business district in the nation.

MANHATTAN

Development of Manhattan proceeded from south to north, essentially from the first day of the first settlement. The core of commerce would expand, driving residential uses before it, which, in turn, would subsume suburban communities that had themselves been developed on farmland. This process went on unabated until the early 20th century. At that point, most of the city's banking, finance, insurance, and other service businesses were located in lower Manhattan. During the first three decades of the century, with new subways (and the Hudson River tubes from New Jersey) enhancing access and new technology permitting construction of skyscrapers, this district expanded greatly. In the 1920's and early 1930's "modern" office development began to expand in Midtown, as well. In addition to the buildings around GCT, Rockefeller Center and the Empire State Building were constructed at this time. The expansion of the city's commercial district did not continue the usual pattern of advancing northward, because by this time the transportation infrastructure was in place and construction technology and city development policy encouraged development of larger buildings in or near already established central business district areas.

During the boom economy of the 1950's and 1960's, most of the new development took place in Midtown. The earliest buildings were on Park Avenue (including Lever House, the first steel and glass skyscraper, built in 1952), with some on Madison, Lexington and Fifth Avenues. Development followed outward from this core to Sixth Avenue and Third Avenue. With the notable exception of the Penn Plaza development discussed above, this trend was generally north of 42nd Street, between Sixth and Third Avenues (see Figure 3-2 for current land uses).

After the recession of the 1970's, the next wave of Midtown development contained more westward movement, primarily as a result of city policy in the form of the Special Midtown District. Adopted in 1982, this district covered all of what is now defined as "Midtown" and gave the greatest floor areas and design flexibility to the West Side, particularly the Times Square area, which was considered to be underutilized. By the late 1980's a number of buildings were completed; although many of these were not fully occupied until after the recession of the 1990's. The Times Square area, further bolstered by the success of the 42nd Street Development Project, is now a solid, first-class commercial district. It is also the Theater District.

In the post-World War II period, the Lower Manhattan Central Business District (CBD)* expanded as well. Early 20th century skyscrapers (e.g,. the Singer and City Investing Buildings) were razed to make way for even larger buildings; and the areas eastward to Water and South Streets, southward on Battery Park Plaza, and westward in Battery Park City (a publicly sponsored project) were developed. This growth was less robust than that of Midtown, however, and by the 1980's it was clear that Midtown had become the more desirable and prosperous of the two Manhattan CBD's. Current trends, supported by public policy, are to convert Lower Manhattan's older office buildings to residential use (e.g., 71 Broadway, 25 Broad Street, 40 Wall Street) and create a 24-hour community of residents, workers, and visitors.

The 1980's and 1990's have also seen the re-emergence of Lower Fifth Avenue (now called the Flatiron District) and Park Avenue South as strong office districts, housing architecture/engineering, advertising, publishing, and new technology firms, among others.

LONG ISLAND CITY/SUNNYSIDE

Construction of the LIRR link to Manhattan had major land use effects in Long Island City and Sunnyside, in addition to the center city. At the turn of the 20th century, Long Island City had been recently consolidated into New York City. It was a large area, including much of what is considered to be Astoria and Sunnyside today, but unevenly settled. There were pockets of development in the Astoria and Steinway areas, industries along the waterfront in Hunters Point and frame houses between Hunters Point and 35th Street, the County courthouse at Thomson and Jackson Avenues, and a small village in Sunnyside, but in the center lay a large expanse of farmland and the swampy headwaters of Dutch Kills.

Railroad activities began in the area in 1900, when plans were laid for the New York Connecting Railroad to link the LIRR and New Haven railroads. As part of this project, Hell Gate Bridge was constructed as a grade-separated right-of-way, entirely on private property. The PRR's plan to dig tunnels under the Hudson and East Rivers and to construct a major terminal in Manhattan required a power plant and a very large rail yard. The power plant and Sunnyside Yard were created on land in Long Island City. In 1905 and 1906 the railroad bought properties

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* While Manhattan's Central Business District (CBD) is generally the area south of 60th Street, for practical purposes, there are in effect two CBDs, representing the locations in that area where business is most concentrated—Midtown and Lower Manhattan. The city's third CBD is Downtown Brooklyn.

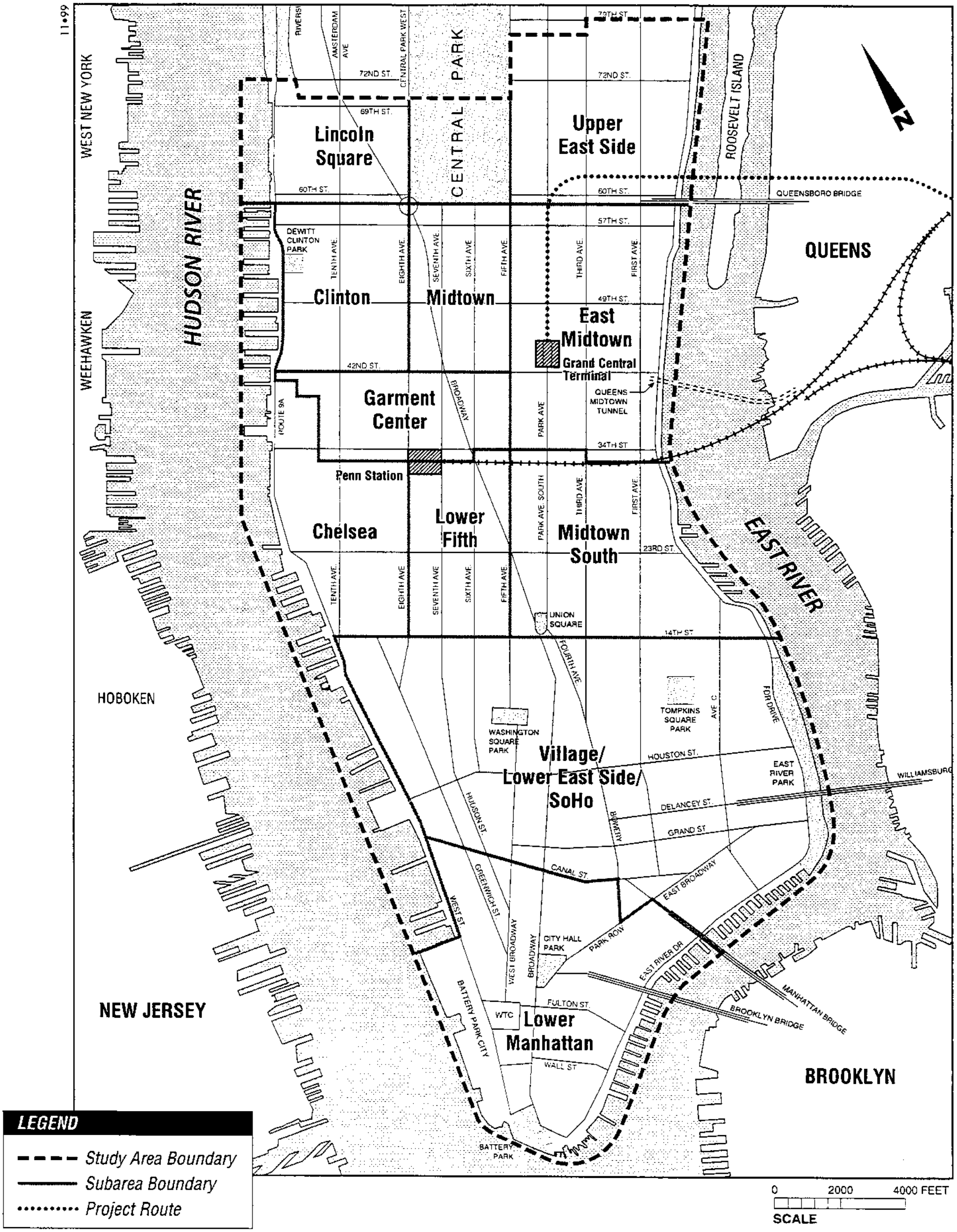

Figure 3-1

Manhattan Land Use Study Area

as necessary and undertook a major land reformulation effort. A 200-foot hill and other higher lands were leveled to fill in swampy areas and create a flat area for the yard. Soil from the excavation of the rail tunnels and the nearby subway tunnels (also under construction at the time) was also used to fill the area. When it was completed, the topography of Long Island City was dramatically different. Properties and streets had been removed and the yard cut Long Island City in two for its entire width, although six viaducts preserved the flow of traffic between the two areas.

The change in landscape and the new rail service, particularly the potential for freight service, opened up new development opportunities. From 1905 to 1908, the Degnon Company acquired the low-lying meadow land on both sides of Dutch Kills, filled it using excavation from the two tunnels, widened the Dutch Kills channel to 150 feet by building bulkheads on both sides and dredging it to a depth of 23 feet, obtained a franchise to build rail connections to the LIRR, and set up a major industrial park that survives to this day. South and east of the railroad yards, and west of Van Dam Street, the Degnon Company induced companies to locate in the new "Degnon Terminal" industrial park by offering cheap land and cheap shipping through the Dutch Kills channel and its connection to Newtown Creek, and through the railroad track connections directly into any of the industrial plants. The project's success was accelerated by construction of subway service and the Queensboro Bridge at approximately the same time and by the rapid growth of American industry in that era. The presence of jobs in and around the industrial park contributed to the development of a residential neighborhood in the former open areas of Sunnyside.

On the other side of the yard, construction of the Queensboro Bridge in 1909 entailed creation of a grand, very wide boulevard (Queens Boulevard) with grassy malls and other appurtenances. It lasted only 5 years, until the elevated lines for the No. 7 and N trains were constructed, effectively chopping up the large space into traffic islands. Nonetheless, the introduction of rapid transit service and the subsequent rise of the automobile created a node of "downtown" (e.g., banking and commerce) uses on the north side of Queens Plaza and supported a variety of street level retail uses on Queens Plaza South.

C. EXISTING CONDITIONS

REGIONAL OVERVIEW

The LITC encompasses a broad range of land uses in Manhattan, Brooklyn, and Queens, and Nassau and Suffolk Counties, from the low-density and largely residential communities of Long Island to the densely developed urban commercial core of New York City. Within this region, the LIRR links Penn Station to Brooklyn, Queens, and Long Island with 10 rail lines: the Port Washington, Oyster Bay, Port Jefferson, Hempstead, Ronkonkoma, West Hempstead, Far Rockaway, Long Beach, Babylon, and Montauk Branches. Based on fall 1998 ridership statistics, almost 90,000 people take the LIRR into Penn Station (the primary terminal of the LIRR and its only one located in Manhattan) each morning. This pattern of movement supports, and in fact makes possible, the density of the built environment in the city, particularly in Midtown Manhattan.

MANHATTAN STUDY AREA

The Manhattan land use study area (see Figures 3-1 and 3-2), which contains the vast majority of final destinations of the LIRR riders traveling to Manhattan (about 95 percent of destinations fall within the study area), is large and varied. Thus, in the following discussion, Manhattan is broken down into the smaller study areas, or subareas, which are contiguous with those analyzed in Chapter 4, "Social Conditions" and Chapter 5, "Economic Conditions and Relocation":

- Lower Manhattan, extending as far north as Canal Street and the Manhattan Bridge. This zone includes Wall Street and the financial district, Battery Park City and the World Trade Center, the Civic Center, and Tribeca.
- Village, between 14th Street and Canal Street. This area contains the neighborhoods of Greenwich Village, SoHo, the East Village, the northern part of Chinatown, and the Lower East Side.
- Chelsea, west of Eighth Avenue between 14th and 33rd Streets. Along its western edge this subarea also extends north to 39th Street to include the Jacob K. Javits Convention Center.
- Lower Fifth Avenue, between Fifth and Eighth Avenues and 14th and 34th Streets. This subarea includes Penn Station, Madison Square Garden and Penn Plaza, the Flower District, and the Ladies' Mile retail district.
- Midtown South, east of Fifth Avenue between 14th and 34th Streets. This subarea includes the neighborhoods of Gramercy Park, the Flatiron District, Union Square, Midtown South, and Stuyvesant Town/Peter Cooper Village.
- Garment Center, west of Fifth Avenue between 33rd and 42nd Streets (exclusive of the Javits Center). Aside from the Garment Center itself, which is the heart of New York's fashion industry, this subarea includes Bryant Park and the New York Public Library, Herald Square, and the Port Authority Bus Terminal.
- Clinton, west of Eighth Avenue between 42nd and 59th Streets. This subarea comprises the mixed-use, largely residential neighborhood of Clinton.
- Midtown, between Fifth and Eighth Avenues and 42nd and 59th Streets. This subarea includes Times Square, Rockefeller Center, the Diamond District, and the residential and hotel uses along Central Park South.
- East Midtown, east of Fifth Avenue between 34th and 59th Streets. This subarea includes GCT and the heart of the Midtown office district, the United Nations, and the neighborhoods of Murray Hill and Tudor City.
- Lincoln Square, west of Central Park West, roughly between 59th and 72nd Streets. This subarea includes the cultural and institutional uses surrounding Lincoln Center and the southern part of the Upper West Side neighborhood.
- Upper East Side, east of Fifth Avenue, between 59th and 79th Streets. This subarea includes the residential, retail, and health care related uses (centered along York Avenue) of the southern portion of the Upper East Side.

LAND USE

Lower Manhattan Subarea

Below Canal Street and the Manhattan Bridge approach, predominant land uses (see Figure 3-2) are defined by the Wall Street financial district, the World Trade Center and Battery Park City, governmental uses of the civic center, the Tribeca mixed-use neighborhood, and portions of Chinatown and the Lower East Side. The Wall Street area, home to the New York Stock

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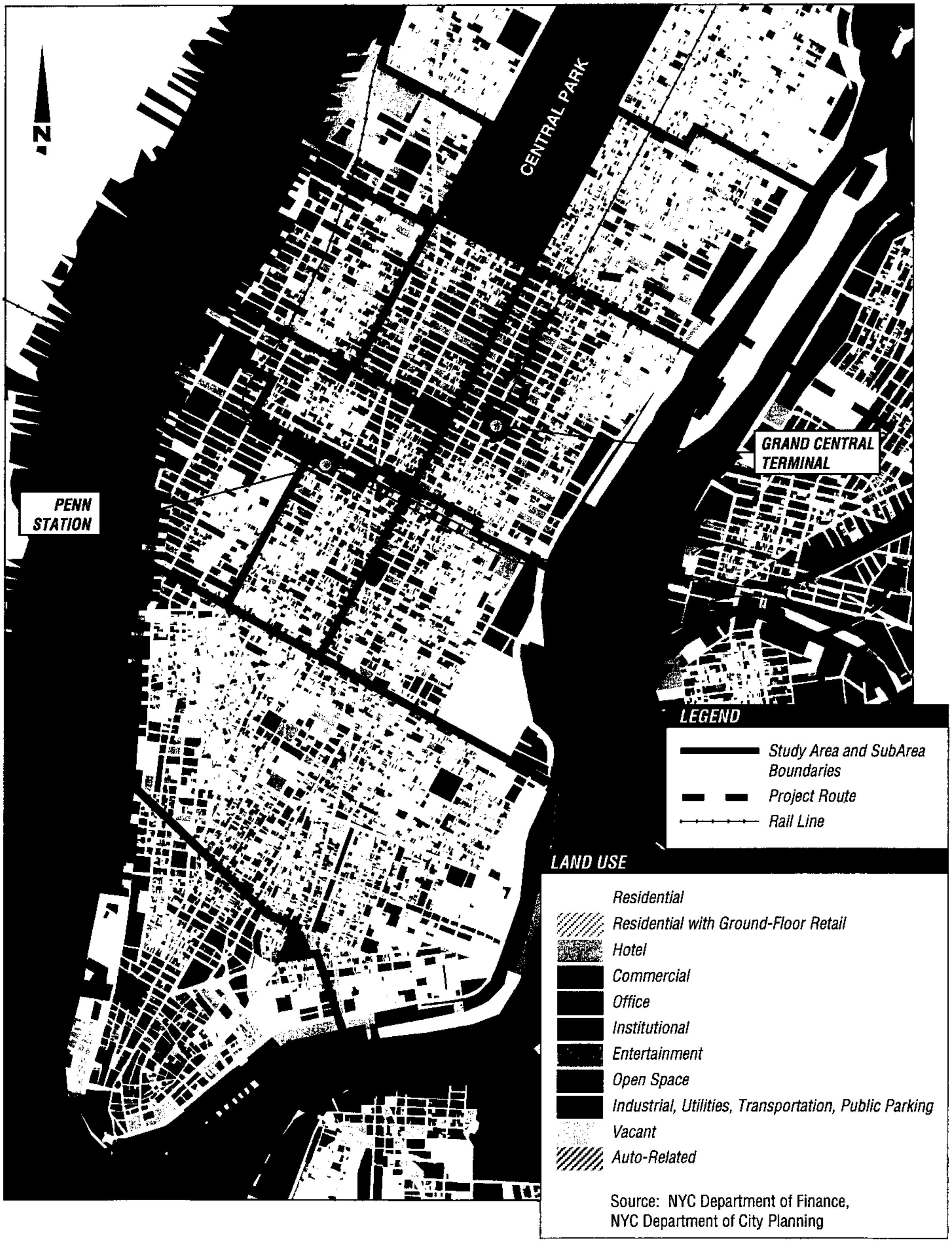


Source: NYC Department of Finance,
NYC Department of City Planning

Figure 3-2

Land Use: Manhattan Study Area

Exchange, is the heart of the downtown business district. Dense office development characterizes the area, with numerous historic skyscrapers and more modern towers. Recently, in response to public policies aimed at increasing the residential character of the financial district, there have been a number of conversions of commercial buildings to residential use.

The World Trade Center, a complex of commercial buildings bounded by West, Church, Vesey, and Liberty Streets, centers on the "twin towers" that each have more than 4.5 million square feet of space. Below the complex is a concourse featuring retail stores and connections to the subway and Port Authority Trans Hudson (PATH) trains. On the waterfront in this area is Battery Park City, a 92-acre mixed-use development begun in the 1970's on land created from fill. It lies west of West Street and extends from Battery Place to north of Chambers Street. Forming the commercial core of Battery Park City is the World Financial Center, a complex of office towers with retail uses centered around a ground-floor atrium. Flanking the World Financial Center to the north and south are residential communities with shopping and restaurants, public open spaces, a waterfront esplanade and marina, the Jewish Heritage Museum and Stuyvesant High School. Development of Battery Park City is ongoing, and future buildings will continue to be constructed on currently vacant sites until the planned development is completed.

The city's civic center contains a concentration of municipal and government functions centered around the area north of City Hall, including Foley Square and extending as far north as White Street. Government buildings in this area include City Hall, the Municipal Building, several courthouses, the headquarters of the New York City Police Department, and others. Between Canal Street and the Civic Center is the lower part of Chinatown, which is described below under the discussion of the Village subarea. Further east, the area between the Manhattan and Brooklyn Bridges is primarily residential, with a mix of public housing, tenements, and institutional uses.

North of the financial district and west of Broadway is Tribeca, a neighborhood characterized by a mixed and varied land use pattern containing residences, light industrial/warehouse space, commercial space, and ground-floor retail. Many of the mid-rise industrial and warehouse buildings in the area have been converted to residential lofts, commercial uses, or a combination of living-work spaces for artists. In general, the western portion of Tribeca is more residential than the eastern portion, and residential conversions continue to be a strong trend.

Village Subarea

Stretching from Canal to 14th Street, this subarea contains the neighborhoods of SoHo and NoHo, Chinatown, the Lower East Side, Greenwich Village, and the East Village. It is predominantly residential, with lower density than the areas to its north and south. SoHo occupies the southwestern part of the subarea. Although originally a bustling industrial district, over the past 30 years, artists and others have converted buildings into studios, galleries, offices, and apartments. The area has now become a fashionable residential and retail neighborhood that also includes numerous restaurants, galleries, nightclubs, and boutiques. West of Sixth Avenue, the neighborhood is predominantly a mix of warehousing operations, offices, and industrial buildings, and has traditionally been a center for printing businesses. The larger buildings have been recently converted to standard office space. Like SoHo to its south, NoHo, a small neighborhood between Broadway and the Bowery/Third Avenue, is generally characterized by industrial loft buildings, many of which have been converted to residential use and some to office use, with a mix of commercial and ground-floor retail space.

East of SoHo are Chinatown and the Lower East Side. Generally, these are densely populated residential neighborhoods of walk-up tenement buildings dating from the high-immigration years of the 19th century. On the Lower East Side there are also numerous public housing complexes. The Lower East Side is famous for its ethnic neighborhoods (Chinatown and Little Italy) and its discount shopping centered on Orchard Street.

Greenwich Village, including the West Village, is primarily a low-rise, historic residential neighborhood, between Houston and 14th Streets west of approximately Broadway. Major institutions within this area include St. Vincent's Hospital and New York University (NYU), which is centered around Washington Square Park. Commercial uses are generally limited to retail shops along the major streets and avenues; office uses are not common in this area.

The East Village, which extends east from Third Avenue, is a primarily residential neighborhood with land use patterns similar to those on the Lower East Side. The western portion of the neighborhood is occupied largely by low-rise, walk-up residential buildings, while the eastern portion contains large-scale public housing projects. In recent years, a trend of rehabilitation of existing residential buildings and construction of new mid-rise residential buildings in this area has begun to revitalize the neighborhood.

Chelsea Subarea

The Chelsea subarea contains a wide variety of land uses. The area west of Tenth Avenue is industrial. There is a mix of freight handling and transportation-related activities that rely on the area's excellent access to points west of the Hudson, and other industrial uses. A large rail yard, the LIRR West Side Yards, is bounded by Tenth and Twelfth Avenues and 30th and 34th Streets. Eleventh Avenue passes above the yard on a viaduct. Recently, the area around Tenth Avenue and 23rd Street and the Gansevoort Meat Market at 14th Street have seen an influx of galleries—both new and relocated from other, more expensive areas.

Between Eighth and Tenth Avenues up to approximately 30th Street is the residential area of Chelsea. Housing types range from low-rise townhouses and walk-up apartments to high-rise apartments. A large complex of publicly sponsored housing dominates the area north of 23rd Street. Commercial uses in the area are generally local retail shops that provide goods and services to the nearby residential community. Major institutional uses in the subarea include the Jacob Javits Convention Center, the General Post Office, and the General Theological Seminary, the oldest Episcopal seminary in the country.

Lower Fifth Avenue Subarea

This subarea, which runs from 14th to 34th Street between Fifth and Eighth Avenues, contains a mix of uses and neighborhoods, generally moving towards denser development going north. South of 23rd Street the area is largely residential, with a strongly emerging spine of commercial uses in loft buildings from Fifth to Sixth Avenue. Recently, a vibrant shopping district has materialized in the old Ladies' Mile department stores on Sixth Avenue between 17th and 23rd Streets. North of 23rd Street, uses are more consistently commercial, including the toy center at Fifth Avenue and 23rd Street, the import-export businesses that line Broadway and its side streets, the flower district at 28th Street and Sixth Avenue, and the Penn Station/Madison Square Garden complex, which occupies the large block bounded by 31st and 33rd Streets and Seventh and Eighth Avenues. There are three primary uses within the complex: below grade are subway and rail operations (and supporting retail uses); above grade on the west side of the block is Madison Square Garden; and on the east end of the block is a large office building (2

Penn Plaza). The area surrounding Penn Station includes several large office buildings (collectively referred to as Penn Plaza), a hotel, the Farley General Post Office building, retail stores, and some residential buildings. Retail uses are concentrated near Herald Square, at the intersection of 34th Street, Broadway, and Sixth Avenue.

Although the area north of 23rd Street is still predominantly commercial, there is a substantial number of residential uses in converted loft buildings, row houses, tenements, and newly constructed high-rise buildings. The recent rezoning of Sixth Avenue from 23rd to 31st Streets to permit residential use in addition to commercial use has resulted in high-rise residential construction.

Midtown South Subarea

This subarea, from 14th to 34th Street on the East Side, includes Union Square, the Flatiron District, Stuyvesant Town and Peter Cooper Village, Gramercy Park, Kips Bay, and Park Avenue South. Although mixed-use overall, the areas west of Lexington Avenue are predominantly commercial, the area east of Third Avenue and the area south of 23rd Street are residential, and the easternmost portion of the study area (between 23rd and 34th Streets and east of First Avenue) is dominated by medical uses.

Union Square Park lies in the southwest portion of the study area. The neighborhood surrounding it contains a mix of commercial and residential uses, with larger retail stores concentrated on the square and along 14th Street. The largest residential developments in the area are Stuyvesant Town and Peter Cooper Village, which together contain more than 11,000 rental apartments. The sprawling complexes, built by the Metropolitan Life Insurance Company, extend from First Avenue to Avenue C and from 14th to 23rd Streets.

The area surrounding Madison Square Park, located between Fifth and Madison Avenues and 23rd and 26th Streets, is characterized by large-scale commercial development. South of Madison Square is the Flatiron District, which contains a range of commercial and residential uses. The neighborhood's predominant building type, the loft, has resulted in an amalgam of uses including office, photography, home furnishings, and residential conversions. Extending north from the park, along Madison and Park Avenues land use generally consists of offices and ground floor retail. Except for the Waterside residential complex at 25th Street and the East River, land uses east of First Avenue are health care-related. The area includes Bellevue Hospital, NYU Medical Center, the Veterans' Administration Medical Center, and the Hunter College Brookdale Health Center.

Garment Center Subarea

Overall, land use in the Garment Center subarea is characterized by the garment industry, retail, office, and transportation-related uses. The heart of the Garment Center, between Seventh and Ninth Avenues, has many large loft buildings used as manufacturing and office space by the fashion industry. In this area, Broadway is lined with large office buildings, most of which are related to the fashion industry, although the current tight office market has lead to the influx of general office tenants as well.

The area west of Ninth Avenue is largely transportation-related uses, with much of the area taken up by the network of entrances and exits for the Lincoln Tunnel. The Port Authority Bus Terminal, on Eighth Avenue between 40th and 42nd Streets, is another major transportation site. Businesses located in this area include shipping and warehousing operations, auto-related uses, and other industries.

Land uses in the northeast portion of this subarea are largely defined by Bryant Park and the main branch of the New York Public Library, and the office buildings and institutional uses clustered around their perimeter. Restored in the late 1980's and early 1990's, the 9.6-acre Bryant Park is a key open space in midtown, attracting large numbers of workers from the adjacent area and users of the New York Public Library (which falls within the park's boundaries). Surrounding the park and library are a mix of older and newer office buildings. Aside from the library, other institutional uses include the City University of New York (CUNY) Graduate Center on 42nd Street and a library branch at 40th Street and Fifth Avenue. Farther west on 42nd Street, land uses change to reflect their location at the southern end of Times Square, and include theaters and entertainment retail (such as a Disney superstore). Several major sites are also under office construction as part of the 42nd Street Development Project.

South of Bryant Park, the west side of Fifth Avenue is lined with large office buildings, including Republic Bank Tower and 420 Fifth Avenue. Also on this part of Fifth Avenue is Lord & Taylor, a major department store located between 38th Street and 39th Street, and a number of ground-floor retail uses with offices above.

Clinton Subarea

Land use in Clinton, formerly known as Hell's Kitchen, is characterized by residential apartment buildings in its eastern half, with mostly warehouses and auto-related uses in its western half. In the eastern portion of the subarea, between Eighth and Tenth Avenues, the area's historical role as a working-class neighborhood remains visible in the tenements that line its streets. In support of the surrounding residential community, there are several public and private schools, and local retail shops are generally found along the avenues. St. Claire's Hospital and St. Luke's-Roosevelt Hospital are also located in this area. Rising above the rest of the neighborhood is the 49-story Worldwide Plaza office development, on the block bounded by Eighth and Ninth Avenues and 49th and 50th Streets.

The western part of the subarea (west of Tenth Avenue) is largely warehouses and loft buildings. Many of the businesses in this area involve transportation, shipping, and storage. Auto-related uses are concentrated along Eleventh Avenue, including garages, service stations, and car showrooms. Along with a scattering of houses and apartments, there are several high-rise residential apartments in the area north of 50th Street, primarily in the Clinton Urban Renewal Area.

Midtown Subarea

Within this subarea are Times Square, Rockefeller Center, the Diamond District, the west side of Fifth Avenue, and Central Park South. The range of land uses includes theaters and entertainment, offices, retail, hotels, and some residential development. Times Square is centered at the crossroads of Broadway and Seventh Avenue a few blocks north of 42nd Street, and lies at the southern edge of the subarea. The many theaters and lively signage of Times Square reflect its history as a center of entertainment, and it remains a popular tourist destination. Planning efforts undertaken since the 1980's have resulted in new and ongoing development, a revitalized entertainment industry, and reinvestment in the area. Ongoing and planned projects in Times Square area are discussed below in "Future Conditions Common to All Alternatives."

Rockefeller Center is a complex of 19 commercial buildings extending from 49th to 52nd Street and Fifth Avenue to west of Sixth Avenue. Begun in 1929 and developed over time, Rockefeller Center primarily contains commercial office buildings with shops, entertainment (Radio City

Music Hall), and open public spaces at street level. At the heart of Rockefeller Center is the sunken plaza used as an ice skating rink in winter and for outdoor dining during warmer months. South of Rockefeller Center is the Diamond District, a dense concentration of businesses dealing in jewels and gold. The Diamond District is basically one block long, located on 47th Street between Fifth and Sixth Avenues.

Rockefeller Center anchors the southern end of the Fifth Avenue shopping district (which also falls into the East Midtown subarea). Extending from 49th Street to 59th Street is a high-end retail district marked by stores such as Tiffany Jewelers and Saks Fifth Avenue. The retail strip along 57th Street from approximately Seventh Avenue to Park Avenue commands higher rents per retail square foot than anywhere else in the world.

East Midtown Subarea

The southern portion (34th to 40th Street) of the East Midtown subarea is generally known as Murray Hill, a residential area centered on Park Avenue. Along Fifth, Madison, and Third Avenues, however, are substantial commercial uses. The area east of Third Avenue contains the entrances to the Queens-Midtown Tunnel and fairly recent residential development along First Avenue. Major institutions in the area are the Pierpont Morgan Library and the Business and Industry Library (in the old B. Altman's building). Another major use includes Con Edison's Waterside generating station along the east side of First Avenue—currently scheduled for closure.

North of 42nd Street, this subarea contains the heart of the East Midtown office district between Fifth and Third Avenues and north to 60th Street. East of Third Avenue, uses are generally residential, except for the area around the United Nations. The area along 42nd Street is densely developed with large office buildings in the area near GCT. Directly south of the terminal along East 42nd Street are several large office buildings, including the Chanin Building, Lincoln Building, former Mobil Building, the Daily News Building, and the Pfizer Building. The old Daily News Building is just east of Third Avenue and the Ford Foundation Building is just east of Second Avenue. Together, these buildings create a concentration of intensely developed land uses along the busy East 42nd Street corridor. Land uses closer to the East River are influenced by their proximity to the United Nations, which is sited along the waterfront between 42nd and 48th Streets. North of 42nd Street between First Avenue (United Nations Plaza) and Second Avenue, buildings and offices are characterized by humanitarian groups, international political and governmental organizations, and a hotel.

North of GCT from Third Avenue westward is a continuation of dense commercial development. Park Avenue from GCT to 59th Street is marked by tall office buildings containing corporate headquarters for companies such as Chase Manhattan Bank, Westvaco, and Bankers Trust. Side streets west and east of Park Avenue contain offices of slightly smaller scale. This area is also home to St. Bartholomew's Church on Park Avenue between 50th and 51st Streets and the Waldorf-Astoria Hotel one block south.

Recently, MNR's Grand Central North project created five points of entry and exit from the north end of GCT tracks. These underground passageway's emerge at the following locations: one at the southeast corner of Madison Avenue and 47th Street (383 Madison) and one at the northeast corner, one in each of the "Helmsley Walks" which run north-south in the Helmsley Building between 45th and 46th Streets, and one in the Westvaco Building at Park Avenue and 48th Street.

The Fifth Avenue shopping district lies at the western edge of this section and influences land uses on Madison Avenue, as well. Throughout the area are a number of luxury hotels, restaurants, and shops.

East of Second Avenue are several of the city's most prestigious residential neighborhoods, including Tudor City, Beekman Place, and Sutton Place. Generally located between First Avenue and the East River, these communities, developed in the 1920's and 1930's, are characterized by luxury apartment buildings and townhouses. Their presence has influenced development along First and Second Avenues as well, where many of the traditional tenements have been replaced by modern residential towers.

Lincoln Square Subarea

This subarea comprises the southern part of the Upper West Side neighborhood. Many of the defining characteristics of this neighborhood resulted from urban renewal projects of the 1950's and 1960's. Overall, the area's land use is characterized by a mix of cultural and other institutions, apartment complexes, brownstones, and ground-floor retail and commercial uses.

Cultural and institutional land uses dominate the southern part of the subarea, which includes Lincoln Center for the Performing Arts, St. Luke's-Roosevelt Hospital Center, John Jay College of Criminal Justice, and Fordham University's Lincoln Center Campus. The New York Coliseum building, once the city's primary venue for conventions, is proposed for redevelopment, but in the interim continues, to a lesser degree, to serve as a meeting space.

Housing in this area includes a wide range of building types, ranging from modest walk-up apartments to luxury high-rise co-ops and condominiums. Brownstones are concentrated north of West 68th Street, and older apartments are generally located in the eastern part of the subarea, including many luxury buildings along Central Park West. The most significant new residential addition to the area is Riverside South, between 59th and 72nd Streets and West End Avenue and the West Side Highway. Upon completion, the entire project should bring thousands of new residential units to the area.

Upper East Side Subarea

This subarea contains the southern portion of the Upper East Side neighborhood. Land uses are primarily residential, health care-related, and retail. The area is a center of employment for the health care industry, a land use which predominates on the blocks along York Avenue. In this area are New York Hospital-Cornell Medical Center, Memorial Sloan-Kettering Cancer Center, the Hospital for Special Surgery, and Rockefeller University, a research institute specializing in medical and physical science. Also in the study area is the Manhattan Eye, Ear & Throat Hospital, at 64th Street and Third Avenue.

Residential development includes townhouses and brownstones, high-rise apartments, and walk-up apartments. In support of the area's residential population, there are a number of religious institutions, and public and private schools in the area. Local retail uses, mostly in the form of ground-floor retail, are generally concentrated along the avenues east of Lexington Avenue. Madison Avenue is home to a number of designer shops and boutiques. This subarea is also home to the Bloomingdale's department store.

ZONING

The last comprehensive New York City Zoning Resolution was enacted in 1961. In the past 35 or so years, new development of land has been shaped by the 1961 zoning maps and a number of amendments to those maps. Not surprisingly, Midtown and Lower Manhattan are zoned predominantly for commercial uses, with Midtown covered by the Special Midtown District, written to strengthen Midtown's standing as a business core, to provide incentive for further growth in specified areas on the West Side, and to support and preserve the Theater District and Times Square. Of particular interest is the Grand Central Subdistrict, which provides for the transfer of unused development floor area (air rights) from the terminal to a specified surrounding area. A 5-percent portion of the proceeds from the sale of the development rights provides support for the ongoing maintenance of GCT.

Clinton, a historically lower-income residential area, borders Midtown, and a Clinton Special District was created to preserve the lower-scale residential character of the neighborhood. The recent Theater District rezoning, which includes the east side of Eighth Avenue and part of its west side near 42nd Street, will allow larger scale office development to come to Clinton's doorstep, but not enter the heart of the neighborhood.

On the East Side north of 59th Street, the Upper East Side subarea is zoned predominantly for residential uses, with selected areas zoned for commercial uses. On the West Side, the Lincoln Square subarea is also zoned residential, except for the Special Lincoln Square District, which protects the area as a center of the cultural and performing arts.

Zoning around Penn Station—in the Garment Center, Northern Chelsea and the north part of Lower Fifth—is predominantly for manufacturing uses. Manufacturing zones that allow large-scale light industrial uses dot the Penn Station area outside of its immediate surroundings (which are zoned for commercial uses). While these manufacturing zones are designed as buffers to adjacent districts that permit residential use, they do not allow residential use within their boundaries and they allow lower commercial densities than the midtown core. More important, manufacturing space in the Garment Center is specifically protected by the Special Garment Center District, which limits the otherwise as-of-right conversion of manufacturing space to office use in certain areas.

The western half of Midtown South is zoned predominantly for commercial uses, reflecting the CBD's reach southward along Fifth, Madison, and Park Avenues. Midtown South's eastern half is fairly uniformly zoned for residential uses. While Chelsea contains a mix of manufacturing and residential zones, the Lower Fifth Avenue subarea is mostly zoned for manufacturing. South of 14th Street, zoning in the Village subarea is overwhelmingly residential, with manufacturing allowed in its southwestern portion and commercial allowed on the Lower East Side.

As its predominant land use indicates, Lower Manhattan is zoned for high-density commercial uses. Public policy, in the form of a number of tax incentives, promotes a 24-hour commercial/residential community in Lower Manhattan, supporting continued use of feasible office buildings and conversion of others. Development in the area of Lower Manhattan known as Tribeca (in the northwest) is regulated by the Lower Manhattan Mixed Use District, which protects the mix of uses and existing scale of this historic area.

LONG ISLAND CITY/SUNNYSIDE STUDY AREA

The Long Island City/Sunnyside study area, extending generally a half-mile from the site of the proposed Sunnyside station, includes Yard A, Sunnyside Yard, related rail tracks, and parts of the Sunnyside and Long Island City neighborhoods. North of the rail yards, the study area includes the area south of 37th Avenue and east of 21st Street; south of the rail yards, it includes the area north of the Long Island Expressway and west of 39th Place.

LAND USE

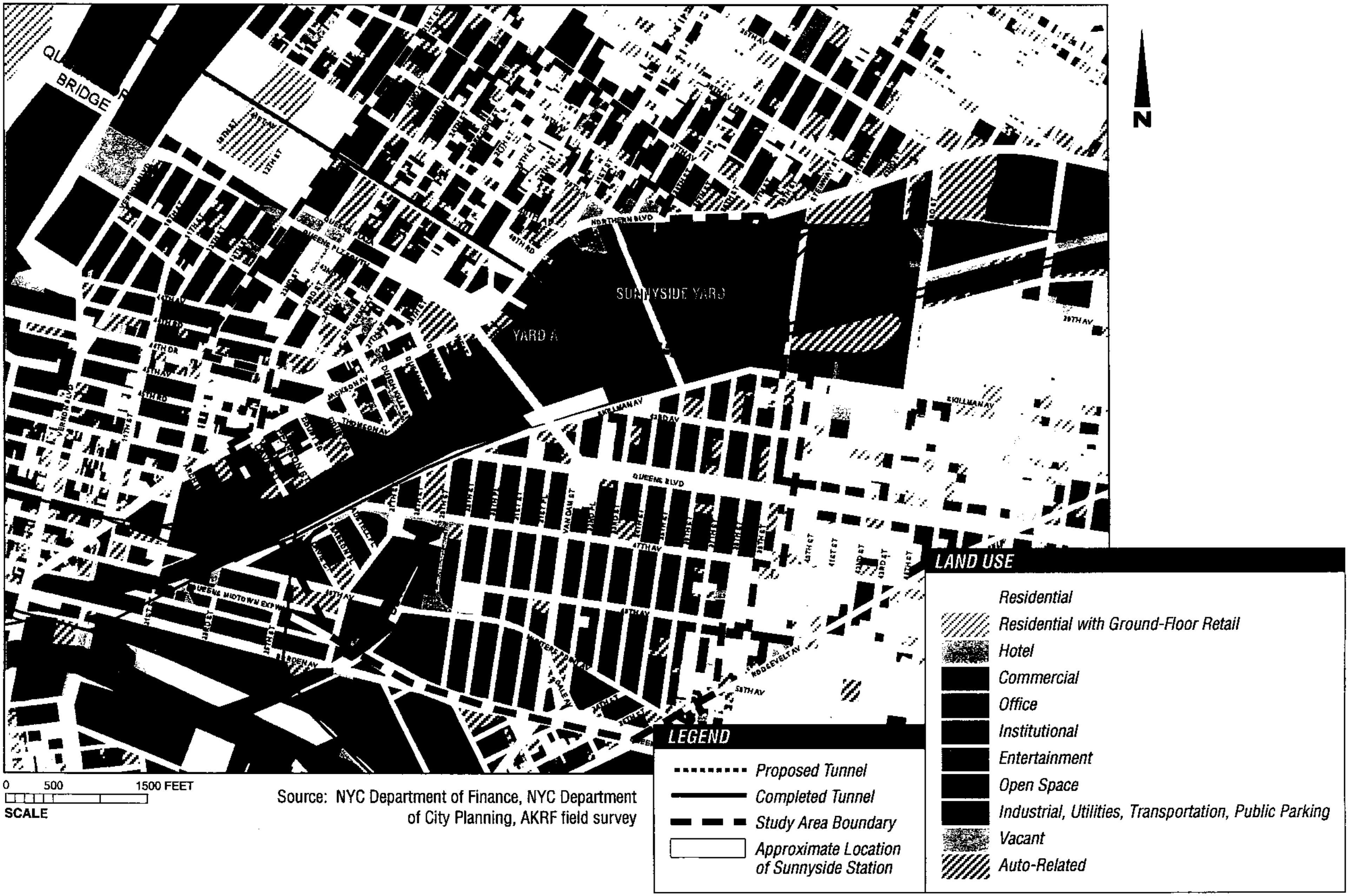
As shown in Figure 3-3, the study area is dominated by industrial uses, containing both heavy and light industry, auto-related industry, and more recently, institutional, commercial and residential space. Sunnyside Yard and Yard A, in the center of the study area, form the largest block of industrial uses. South of the yards, heavy industries are generally located along Dutch Kills and along parts of Hunters Point Avenue, with less intense uses generally located north of 48th Avenue. Two areas of non-industrial use can be found south of Sunnyside Yard. The first is a narrow portion of the western edge of the Sunnyside residential neighborhood east of 39th Street, at the study area's eastern border. The second lies between Queens Boulevard and 47th Avenue, where commercial uses (anchored by the International Design Center, or IDCNY, at 30th Street) and institutional uses (such as La Guardia Community College at Van Dam Street) have taken over former factory sites.

The study area north of Sunnyside Yard is characterized by a wider range of land uses and building types. Downtown Long Island City contains a number of commercial and retail uses along Queens Plaza, and the courthouse and the relatively new Citicorp tower at Thomson Avenue and Court Square. Silvercup Film Studios, a center for film and television production, occupies a converted industrial complex at 21st Street and Queens Plaza. Moving northward from Queens Plaza, commercial and industrial uses dominate, but there are a few residential buildings until the Dutch Kills mixed-use neighborhood, which lies in the northeastern portion of the study area.

ZONING AND PUBLIC POLICY

Zoning in this area includes manufacturing, commercial and residential districts, as shown in Figure 3-4. The vast majority of the area is zoned for manufacturing uses, with a small strip of residential uses permitted along the eastern edge of the study area. Additionally, a portion of the Hunters Point Mixed Use District, which permits commercial uses, lies at the western corner of the study area. Zoning designations in the study area are shown in Table 3-1.

The size of the area's manufacturing buildings, its superior accessibility, and the loss of manufacturing space elsewhere in the city have made Long Island City particularly important as an industrial center. To maintain the strength of the district, the 900-acre area defined by Van Dam Street, Newtown Creek and the East River, and Queens Plaza/Queens Boulevard has been designated as the Long Island City In-Place Industrial Park. This designation allows the city to take an active role in maintaining and expanding industry there. However, within the district, public policy has identified particular areas for different uses: the Special Hunters Point Mixed Use District was recently amended to permit expansion and new construction of residential use there. Perhaps more important, when the city mapped the C5-3 district in the New York City Court Square Subdistrict of the Hunters Point District, it signaled a policy to promote the fourth CBD in Long Island City. The approval by the city and state of the Queens West Development



Source: NYC Department of Finance, NYC Department of City Planning, AKRF field survey

Figure 3-3

Land Use: Long Island City/Sunnyside

Table 3-1

Zoning Designations in the Long Island City/Sunnyside Study Area

Zoning District	Permitted Uses/Bulk
Residential Districts:	**Commercial and manufacturing use prohibited; community facility permitted.**
R5	Detached, single- or two-family homes, maximum FAR 1.25
Commercial Districts:	**Residential and community facility use permitted). Commercial districts can be mapped as zoning districts or as overlays in residential districts. Commercial overlays permit low-density development of commercial uses.**
C1-1	Low-density neighborhood shopping. Low- to medium-density residential and community facility.
C5-3	High-density commercial district, maximum FAR 15.0.
Manufacturing Districts:	**Residential use generally prohibited.**
M1-1, M1-4	Low-density light industrial uses (high performance) and certain community facilities.
M1-3, M1-3D	Medium-density light industrial uses (high performance) and certain community facilities. Similar to M1-5, but intended for use outside Manhattan.
M1-5	Medium-density light industrial uses (high performance) and certain community facilities. (Conversion of nonresidential to residential permitted in M1-5M.)
M3-1, M3-2	Low density heavy industrial (low performance).
Special Purpose Districts:	
HP	Special Hunters Point Mixed Use District

Source: Zoning Handbook, New York City Department of City Planning, 1990.

project just outside the study area also reflected a policy for appropriate mixed-use (commercial and residential) development of portions of the industrial waterfront in Long Island City.

LONG ISLAND

Long Island consists of four counties: Kings (or Brooklyn) and Queens in New York City, and Nassau and Suffolk. It is known in the region as "The Island," stretching 120 miles from the western shores of Sunset Park and Bay Ridge in Brooklyn to Montauk Point at its eastern tip. Land uses vary from the high-density CBD of downtown Brooklyn to the rural farms and wineries of the North Fork in Suffolk County. The majority of the Island is suburban and residential, with small to moderate sized villages and towns. The discussion below focuses on Nassau and Suffolk Counties, since most often the term "Long Island" is used to refer to those two counties together, and not to Brooklyn or Queens.

NASSAU COUNTY

Nassau County consists of three towns: Hempstead, Oyster Bay, and North Hempstead; two cities: Glen Cove and Long Beach; and 64 incorporated villages. Except for the boroughs of New York City, Nassau County is the most densely settled county in the state, with almost 1.3 million residents living on 287 square miles (more than 4,500 people per square mile). However, this density is deceptive: Nassau County is overwhelmingly suburban, with its most intensely developed centers constructed at a low scale of approximately 0.4 FAR.

Residential Land Use

Land uses in Nassau are predominantly residential throughout (87 percent of tax parcels and 55 percent of acreage in 1997) (see Table 3-2). Residential densities range from extremely low (less than one dwelling unit per five acres) to high (11+ dwelling units per acre). Low densities predominate in Oyster Bay east of Glen Cove Road and north of Jericho Turnpike, and in the North Hempstead villages of Kings Point and Sands Point. High-density residential uses are extremely few in Nassau County and almost all are located adjacent to the Long Island Expressway—in North Hills and at the border of Old Westbury and Oyster Bay. The majority of residential properties are medium-density, single-family homes located south of Jericho Turnpike or west of Glen Cove Road.

Table 3-2
Land Area by Land Use Category in Nassau County, 1998

Land Use Category	Acres	Percent of Total
Residential	100,100	55
Estates and Low Density (1 D.U/acre or less)	21,100	11
Medium Density (2-10 D.U./acre)	73,100	40
High Density (11 or more D.U/acre)	5,900	3
Commercial	9,900	5
Industrial	2,200	1
Institutional	19,300	11
Undeveloped Land	15,000	8
Open Space/Parks	37,200	20
TOTAL	**183,700**	**100**

Source: Nassau County Comprehensive Plan, December 1998.

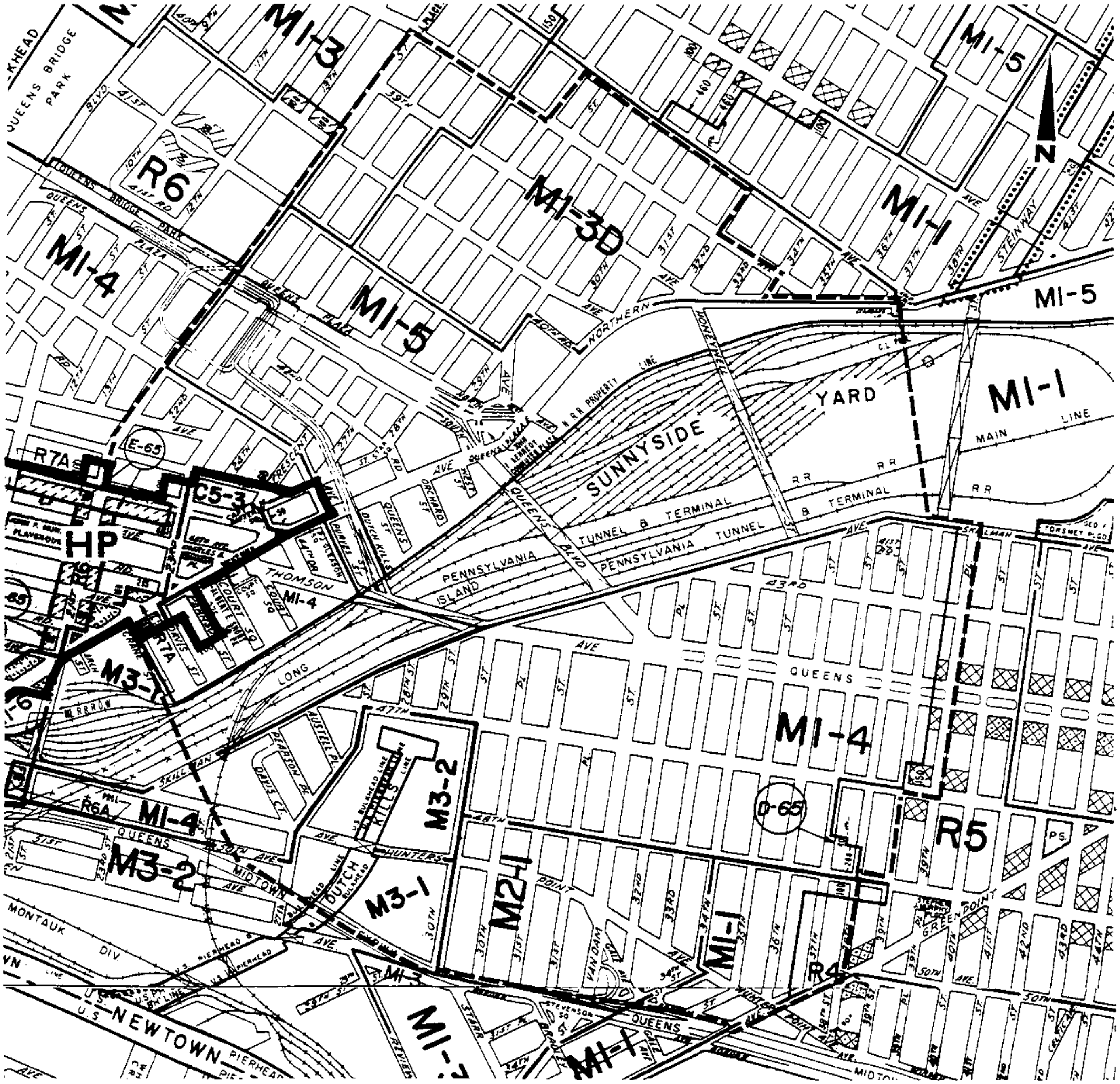
Commercial Land Use: Retail and Offices

Commercial uses center around the village of Mineola, which is the county seat and one of the larger commercial centers in the county. Other larger commercial centers include Hicksville, Garden City, and Hempstead. The widespread use of automobiles since World War II has contributed to the spread of retail establishments along major roads in the county. Currently, strip mall and shopping center retail dominate the landscape adjacent to all major roads.

In 1991, Nassau County had more than 27 million square feet of office space. Most of this space was located in a few clusters: Mitchel Field/Roosevelt Field; Town of Oyster Bay/LIE; Lake Success/New Hyde Park; Mineola/Garden City; Great Neck Peninsula; and the Village of Hempstead.

Open Spaces, Institutional and Other Land Uses

The county is dotted by public parks and open spaces, along with institutional uses such as Adelphi University, Hofstra University, and C.W. Post College (Long Island University).



Long Island City / Sunnyside Land Use Study Area Boundary

Hunterspoint Mixed Use District Boundary

0 1000 FEET
SCALE

C1-1	C1-2	C1-3	C1-4	C1-5	C2-1	C2-2	C2-3	C2-4	C2-5
▨	▩	▨	▩	▨	▨	▩	▨	▩	▒

Figure 3-4

Zoning: Long Island City/Sunnyside Study Area

Zoning and Public Policy

Zoning in Nassau County is determined on a local level, with each locality determining, among other things, permissible land uses, densities, heights and bulks. As such, zoning can vary greatly from municipality to municipality or be quite consistent from one place to the next. The practical result of local zoning is a limitation on the power of the county to determine land uses on a regional level.

The county has, however, developed a land use map showing planned generalized development intensities to 2020 in its 1998 Nassau County Comprehensive Plan. Its land use goal is to:

> Promote a balanced pattern of land use that encourages the concentration of future development in established areas with adequate infrastructure and facilities, so as to make efficient utilization of the transportation network, preserve the County's environmental and scenic resources, and revitalize existing downtowns and Centers.

The County's policy recommendations regarding land use stress the importance of transit-oriented development (i.e., development near transit nodes), the adaptive re-use of existing properties, and, as stated in the goals statement, the revitalization of the county's existing downtowns and town centers. Proposed development intensities closely follow existing LIRR routes. They are highest in towns that are directly served by the LIRR—Mineola, Hicksville, Hempstead, Valley Stream, Lynbrook, Rockville Center, and Freeport.

SUFFOLK COUNTY

Suffolk County consists of 10 towns and 31 incorporated villages. It is an extremely large county by southern New York standards, covering 911 square miles and encompassing a population of more than 1.3 million in 1990. Suffolk County is more than three times larger than Nassau but only one-third as dense (1,451 people per square mile in 1990). It is 86 miles long and spans 20 miles at its widest point. Its three largest towns are Brookhaven (408,000), in the north-central portion of the county; and Islip (300,000) and Babylon (203,000), both in the southwestern portion of the county. Other towns include Huntington and Smithtown in the northwest portion of the county; Riverhead and Southold in the northeast; Southampton and East Hampton in the southeast; and Shelter Island between the North and South Forks. The county seat of Riverhead is relatively sparsely populated, with only 23,000 people living in 67 square miles.

Land Use

Land use patterns are very varied. In some of the county's larger towns, like Huntington, land uses are indistinguishable from towns in Nassau County. Other towns, like Southold on the North Fork, are still dominated by agricultural uses. One characteristic that most Suffolk County towns and villages have in common is the development pressure they continue to face. While some towns have responded to this pressure by welcoming strip-mall and big-box type retail development, other towns have fought aggressively to retain their "small-town" feel and to preserve open spaces.

In much the same pattern as Nassau County, commercial uses in Suffolk County follow the local road and highway system. The Long Island Expressway, Sunrise Highway, and Montauk Highway are all paralleled by commercial strips along much of their lengths, as are a number of smaller main roads in the county. In addition, the county seat of Riverhead includes one of the larger town commercial centers in Suffolk.

Land uses in the western portion of Suffolk County are similar to those in eastern Nassau County: predominantly residential uses of moderate density (2 to 10 dwelling units/acre) in the southwestern towns of Babylon and Islip, and predominantly residential uses of low to moderate density (<1 to 4 dwelling units/acre) in the northwestern towns of Huntington and Smithtown. In Brookhaven, land uses begin to transition from predominantly residential at its western border, to a mix of residential and vacant/open space as one moves east, to predominantly vacant/ open space at its eastern border with Riverhead (in the north) and Southampton (in the south). Throughout western and central Suffolk County, vacant land and open spaces have steadily been claimed for residential and retail uses. Brookhaven National Laboratory in eastern Brookhaven, along with Calverton Naval Weapons Industrial Reserve Plant just to its east in Riverhead, stand out as the county's largest institutional uses.

Moving eastward along the North Fork, the towns of Riverhead and Southold are still dominated by agricultural uses, but residential and commercial uses have grown steadily in the past 20 years. Riverhead, in particular, has seen considerable retail development and now contains one of the most successful outlet malls on the East Coast. Moving eastward along the South Fork, the towns of Southampton and East Hampton have faced intense development pressure, with much of the vacant and open spaces converted to residential use—especially along their south shores. This development has come at the expense of agricultural uses.

Zoning and Public Policy

In attempting to plan for the use and preservation of land on a regional level, the county faces the challenge of home rule: working with zoning regulations that are determined on a local level. Each of 10 towns and 31 villages in Suffolk County determines its own local zoning, making it extremely difficult for the county to achieve a unified land use policy.

As a result, many of Suffolk County's land use policy initiatives center around the preservation of open space and agricultural land through purchase rather than through zoning. The oldest currently active program is Suffolk County's *Farmland Preservation Program* (commenced in 1977), which uses general obligation bonds to fund the purchase of conservation easements on active farmland. This program, which has preserved approximately 7,000 acres of farmland through mid-1999, purchases the development rights to farmland to ensure its continued agricultural use. The *Land Preservation Partnership* (1997) similarly uses bonds to purchase development rights—or full titles—to open space in the county. The county's recent *Greenways* initiative uses a ¼ percent sales tax to fund the purchase of open space that contains vital water resources. In the eastern five towns of the county, an *Open Space Program* (1986) employs a land-bank type approach to purchase open space. Each time land is purchased in Brookhaven, Riverhead, Southold, Southampton, and East Hampton, the buyer must contribute 2 percent of the purchase price to a fund dedicated to buying open space in that town. Together these programs have facilitated the purchase and preservation of over 30,000 acres of land in the county.

Perhaps the most significant land use policy in Suffolk County is the *Central Pine Barrens Zone*, established in 1993. The zone consists of a 100,000-acre conservation area within the towns of Brookhaven, Riverhead, and Southampton. The zone is divided into two sub-areas: a 52,500-acre core preservation area which prohibits almost all new development, and a 47,500-acre compatible growth area which allows restricted development. The zone covers an area roughly from Route 112 in the west to Red Creek Road in Southampton in the east, Route 25A in the north to Sunrise Highway and Old Country Road in the south.

YARD STUDY AREAS

BLISSVILLE YARD

Blissville Yard is located approximately 1 mile southwest of Sunnyside Yard, in Blissville, Queens. The yard lies just east of Dutch Kills and just north of Newtown Creek, at the point where the Montauk cutoff originating from Sunnyside Yard meets the Montauk Branch. Consisting of six tracks, the longest of which is approximately 1,400 feet, Blissville Yard currently has no physical track connection to the Montauk Branch, which parallels the yard to the north. A private access road leading to an industrial site parallels the yard on the south.

The study area for Blissville Yard extends approximately 400 feet from the yard in each direction, encompassing the land that surrounds the yard. This area lies roughly between Dutch Kills on the west, Review Avenue on the north, Greenpoint Avenue on the east, and Newtown Creek on the south.

Land Use

The land surrounding Blissville Yard is entirely industrial (see Figure 3-5). The only means of getting to the yard by car or on foot is via a private access road that begins at the end of 35th Street. Between the yard and Newtown Creek to the south are two heavy industrial uses—the Buckeye Pipeline Company and Getty Gasoline. Between the yard and Review Avenue to the north are a number of 2- and 3-story warehouse buildings, housing various uses, such as storage facilities, wholesalers, and shipping houses. The only non-industrial use in the study area is Teamsters Local 804 building, on the corner of Review Avenue and 35th Street. There are no residences in the study area, nor are there any "sensitive" land uses.

Zoning and Public Policy

The entire study area is zoned for manufacturing, as shown in Figure 3-6. Blissville Yard lies in an M3-1, heavy manufacturing zone, as do all the properties that surround the yard. The few lots in the study area north of Review Avenue, including the Teamsters Local building, lie in an M1-3, light manufacturing zone. This zone often serves as a buffer between heavier manufacturing and residential zones; however, in this case, the M1-3 zone is surrounded entirely by other manufacturing zones rather than residential zones. The only residential zone in the area of Blissville Yard covers Calvary Cemetery, about 1,000 feet east of the yard.

MASPETH YARD

Maspeth Yard is located in Maspeth, Queens, near the intersection of Rust Street and Maspeth Avenue. It is bordered on the west by 49th Street and runs southeast, parallel to Rust Street, to approximately 500 feet southeast of Maspeth Avenue. The railroad area at Maspeth Yard is occupied by a rail yard used by NYAR, and two active LIRR Montauk Branch mainline tracks. It is also where the LIRR's former Haberman station was located. The yard consists of four rail car storage tracks parallel to the mainline tracks, approximately 60 feet south of the mainline. This yard sees some limited rail freight activity daily. The currently vacant area between the mainline and storage tracks formerly included a rail-to-road lumber transfer and distribution center.

The study area for land use at Maspeth Yard is the area within an approximately 400-foot radius of the yard—bordered on the west by 48th Street, on the north by 55th Avenue, on the east by 58th Street, and on the southeast by 58th Avenue.

Land Use

Land use in the study area is dominated by low-scale industrial uses (see Figure 3-7). The majority of blocks are occupied by industrial uses, although some portions of these blocks are vacant. Industrial uses north of the yard are predominantly warehousing and goods distribution. Industrial uses in the study area south of the yard are mostly staging areas for manufacturers along Maspeth Avenue and 49th Lane. The only "sensitive" land uses in the study area are residences in the east portion of the study area. In this area, just east of Maspeth Yard between Maspeth and 58th Avenues, a portion of a residential neighborhood extends into the study area. Uses there include row houses and single-family detached residences, a Korean Methodist Church on a site directly across Rust Road from the rail yard, an auto repair shop, and small retail establishments (a pizza place, delicatessen, and diner).

Zoning and Public Policy

The entire study area is zoned for manufacturing, as shown in Figure 3-8. South of Rust Road (including Maspeth Yard) is zoned M3-1, which allows for heavy industrial uses that generate noise, traffic, and/or pollutants. The study area north of Rust Road, including the small residential area, is zoned for a range of lighter industrial uses, with a mix of M1 and M2 districts. The residential area is zoned M1-1D, a light industrial district in which limited residential uses are allowed upon authorization by the City Planning Commission.

FRESH POND YARD

Fresh Pond Yard is located in Glendale, Queens, at the junction of the LIRR Montauk Branch and the freight connector to the LIRR Bay Ridge Branch. The greater yard is divided into two smaller yard areas—a West Yard and an East Yard. As shown in Figure 3-9, the West Yard extends from the intersection of Metropolitan Avenue and Fresh Pond Road on the west, to the New York Connecting Railroad Line's bridge on the east. The East Yard forms a triangle, extending from the railroad bridge on the west, to approximately 69th Street on the east and Cypress Hills Street on the south. The East Yard also contains NYAR's main offices, which occupy a double-wide trailer in the center of the yard. Separating the West and East Yards is also the NYCT M subway line, which stops at Fresh Pond Road just west of the study area and Metropolitan Avenue just north of the study area. The study area for land use is the area within approximately 400 feet of the Fresh Pond Yard boundaries.

Land Use

Although land uses in the study area (see Figure 3-9) are predominantly residential, the yard is largely bordered by a buffer of industrial uses. South of the yard, low-rise industrial uses form a consistent buffer everywhere except the middle section of the yard, where Mafera Park abuts the yard. Farther south, the residential blocks south and west of Fresh Pond Yard range from small apartment buildings and semi-detached homes, to fully-detached single-family homes.

There are two residential areas that are not buffered from the yard by industrial buildings. Along Admiral Avenue north of the West Yard, homes directly abut the tracks, and along Otto Road between 68th Place and 69th Place, homes are separated from the tracks only by an iron fence and Otto Road itself. In addition, the 5.4-acre Mafera Park, is between the East Yard, the West Yard, the M subway line and 65th Place. The park provides a buffer between the yard and houses along 65th Place and the East Yard. Other uses in the study area include Mt. Olivet Lutheran Cemetery, which abuts the entire north side of the East Yard, and a large enclosed shopping center partially abutting the north side of the West Yard. Metropolitan Avenue and

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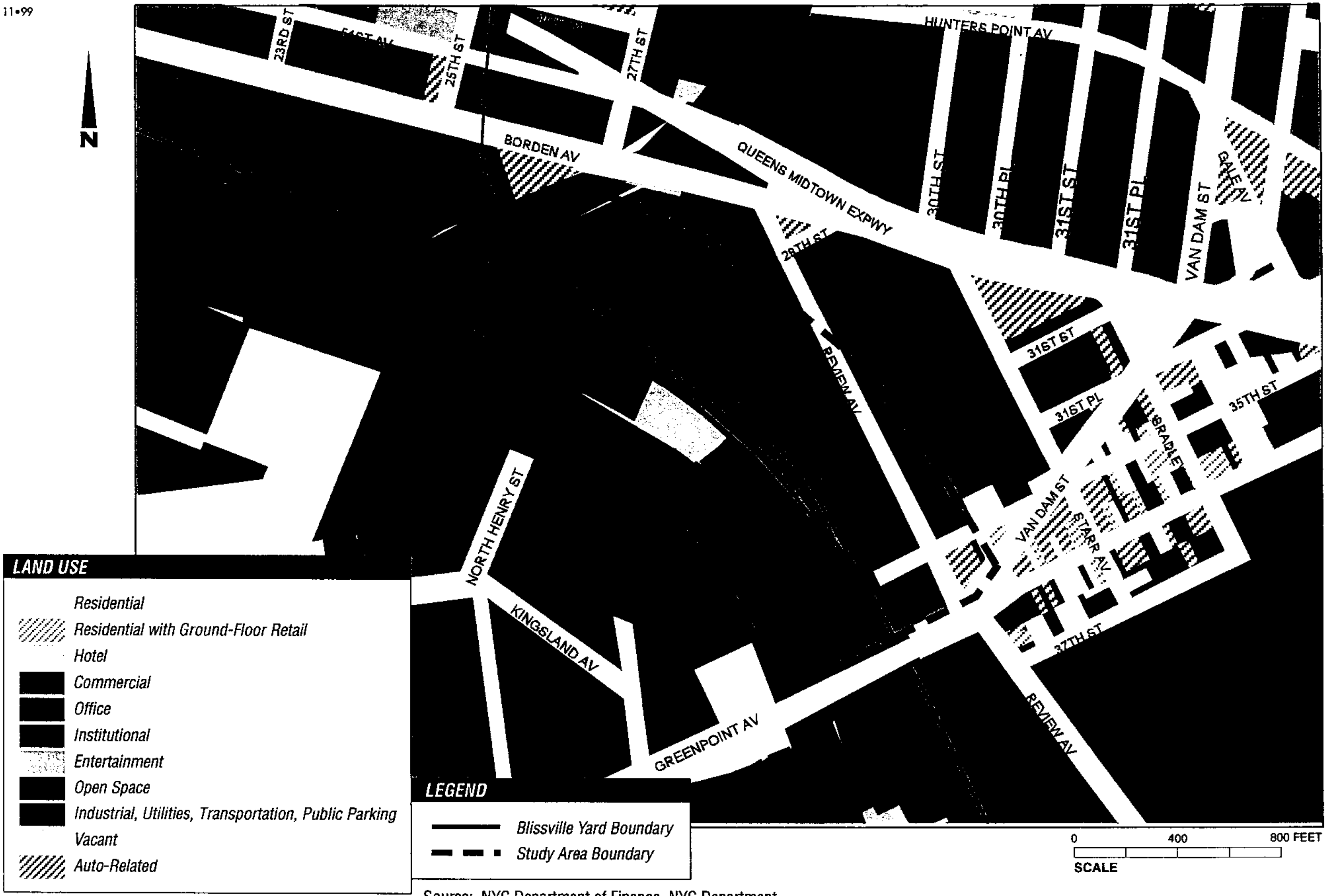


Source: NYC Department of Finance, NYC Department of City Planning, AKRF field survey

MTA / LIRR

East Side Access

Figure 3-5

Land Use: Blissville Yard

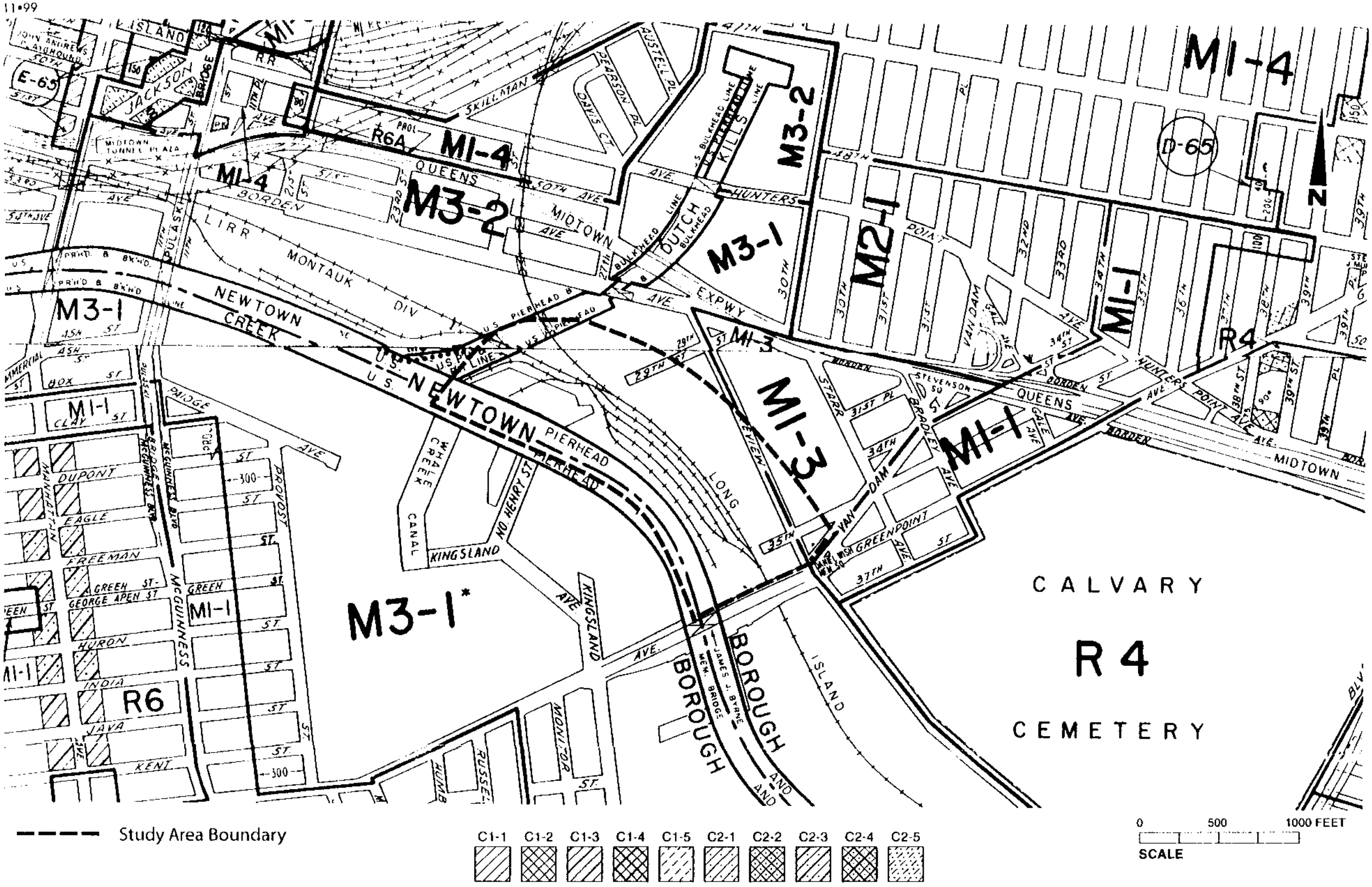
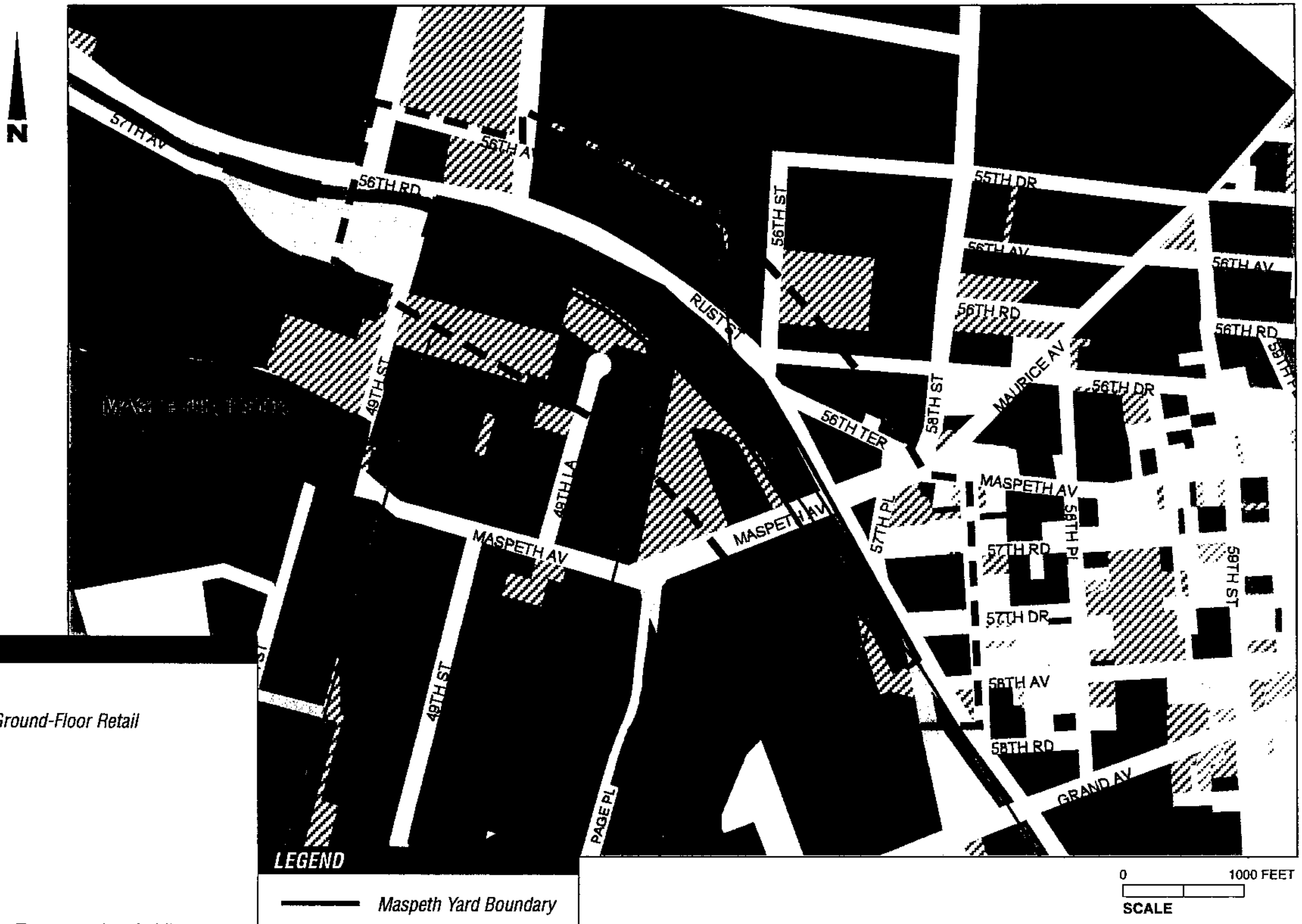


Figure 3-6

Zoning: Blissville Yard



LAND USE

- Residential
- ▨ Residential with Ground-Floor Retail
- Hotel
- ■ Commercial
- ■ Office
- ■ Institutional
- Entertainment
- ■ Open Space
- ■ Industrial, Utilities, Transportation, Public Parking
- Vacant
- ▨ Auto-Related

LEGEND

- ▬▬ Maspeth Yard Boundary
- ▬ ▬ ▪ Study Area Boundary

Source: NYC Department of Finance, NYC Department of City Planning, AKRF field survey

Figure 3-7

Land Use: Maspeth Yard

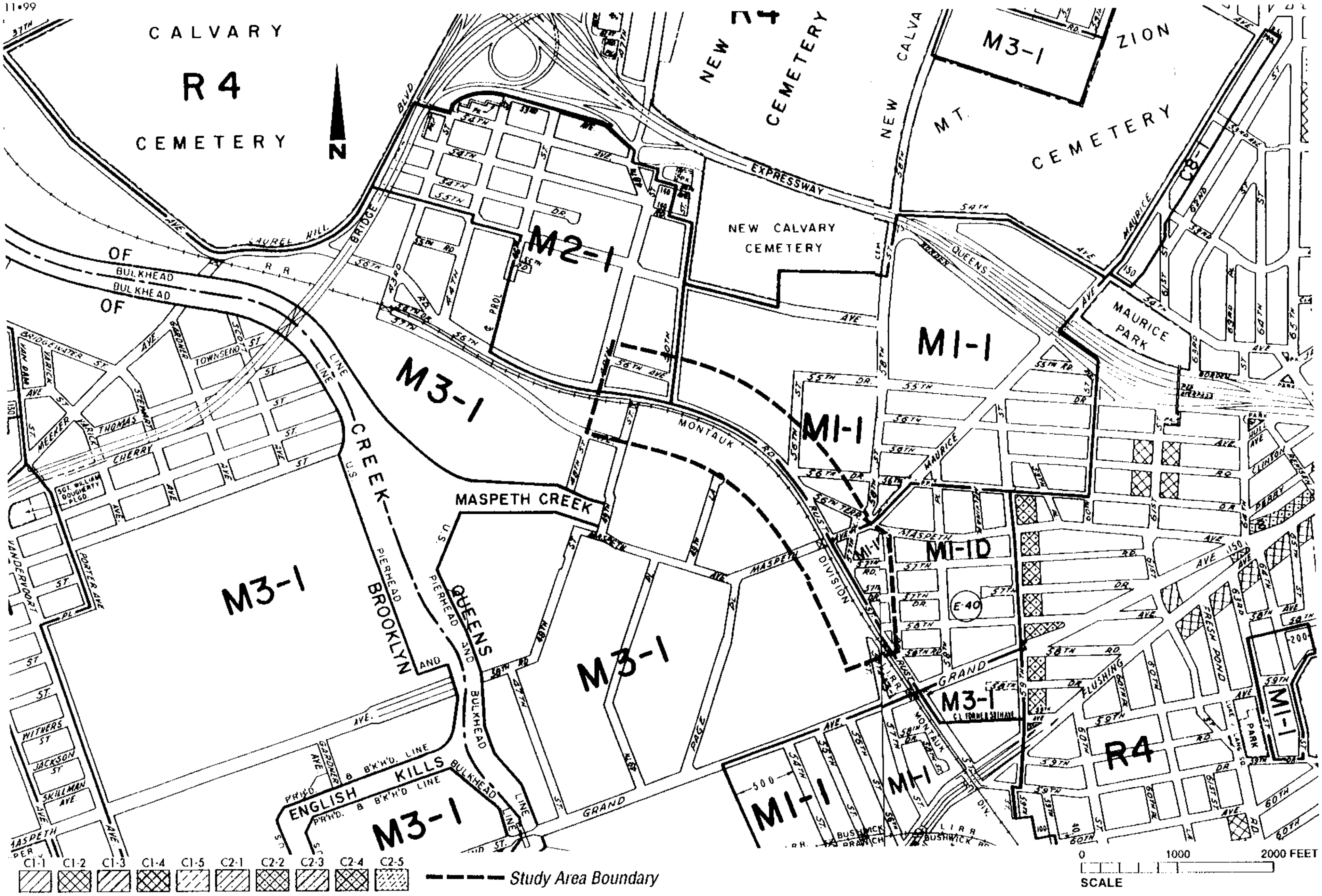


Figure 3-8

Zoning: Maspeth Yard

Fresh Pond Road, in the northwest section of the study area, are lined with predominantly auto-related commercial uses (occasionally with apartments above) and a few light industrial uses. Single- and two-family, semi-detached residences occupy the study area blocks just off Metropolitan Avenue, Fresh Pond Road, and Central Avenue.

Zoning and Public Policy

Fresh Pond Yard itself is zoned M1-1 for light manufacturing uses. Closest to the yard, zoning is also for light manufacturing (see Figure 3-10), covering the areas occupied by the industries fronting on the yard. Outside of this manufacturing area, the zoning is residential, as is appropriate for the residential neighborhood. These residential districts (R4 and R5) permit low- to medium-density development, typically row houses and small apartment buildings. The areas along Metropolitan Avenue and Fresh Pond Road are mapped with commercial overlays that permit a range of local retail and service establishments.

HIGHBRIDGE YARD

Highbridge Yard is located in the Highbridge section of the Bronx, between the Harlem River and the Major Deegan Expressway. The yard runs from the equivalent of West 161st Street on the south to Depot Place on the north. The land use study area for Highbridge Yard is the area roughly within 400 feet of the yard, but includes land on the Manhattan riverfront facing the yard as well.

Land Use

The center of the study area is occupied by the existing Highbridge Yard—a rail yard used by MNR—and two sets of tracks used by MNR's Hudson Line. The Oak Point Link freight rail line runs adjacent to the yard as well. (In addition, the *New York City Greenway Plan* published by the New York City Department of City Planning proposes to use the abandoned Putnam Division railroad line as a bicycle/pedestrian Greenway trail extending as far south as Macomb's Dam Bridge. This area is located between Highbridge Yard and the Major Deegan Expressway.) Just east of these rail uses, the Major Deegan Expressway forms a barrier between the yard and the neighborhood to the east. Sedgwick Avenue is also designated as a bicycle route on New York City's Citywide Cycling Map. In the surrounding neighborhood, land uses are predominantly residential (see Figure 3-11). Highbridge Houses—four 13-story residential buildings between Sedgwick and University Avenues south of West 167th Street—are the primary residential uses in the Bronx portion of the study area. Additional residences on this block include two low-rise apartment buildings with ground-floor retail just south of the Highbridge Houses. The northern end of the study area, on a hill high above the yard, includes low-rise residential apartment buildings. Below them, close to the Major Deegan Expressway, the New York City Police Department Bronx Task Force and several auto-related uses front on Sedgwick Avenue. The northern portion of the study area is dominated by the High Bridge, a stone bridge (closed to traffic) that spans the Hudson River.

The Harlem River forms a strong boundary between Highbridge Yard and uses to the west, in Manhattan. The Harlem River Drive, a parkway for passenger cars with a riverfront pedestrian and bicycle path, runs along the Manhattan shoreline of the river. To the west of the river and drive, most of the study area is occupied by the 119-acre Highbridge Park, on a hill high above the river. Bordered on the west by Edgecombe and Amsterdam Avenues, on the north by Dyckman Street, and on the east and south by the Harlem River Drive, the park forms a buffer between the Harlem River and the residential neighborhoods west of Edgecombe and

Amsterdam Avenues. Below and south of the park, the southern portion of the study area is occupied by a large block of residential uses: the six 30-story Polo Ground Houses and the 14-story Colonial Park Houses, and two elementary schools.

Zoning and Public Policy

Like Fresh Pond Yard, Highbridge Yard lies entirely in a light manufacturing (M1-1) zone (see Figure 3-12). East of the Major Deegan Expressway, the residential portion of the study area is zoned for medium- to high-density residential use (R7-1). In the Manhattan portion of the study area, the residential area is similarly zoned (R7-2), but allows for a slightly smaller parking space allotment.

D. FUTURE CONDITIONS COMMON TO ALL ALTERNATIVES

Future conditions have been examined for 2 years: 2010 and 2020. In all cases, land use conditions for 2020 represent a continuation of trends foreseen for 2010.

MANHATTAN STUDY AREA

The Manhattan study area is a very dense, but very dynamic urban center. Waves of economic development have shaped its form and will continue to do so in the future. In areas, such as East Midtown, that are nearly fully developed, new construction will be limited to the very few sites that can be assembled for redevelopment. Upgrading of usable older buildings will continue. In areas such as West Midtown or Battery Park City, which still have vacant and/or developable sites, new commercial and, as appropriate, residential construction can be anticipated. Conversion of loft or garment center buildings to higher-paying office use will continue. Public policy and zoning will continue to guide the location and density of new or "revised" development. As shown in Tables 3-3 and 3-4, looking at known proposals only, an anticipated total of 29.7 million square feet of office use has been proposed in the study area for completion between 1995 and 2020, along with some 34,452 housing units (1 unit = 1 apartment or single-family home).

Table 3-3

Known Development Projects in Manhattan Study Area, 1995-2010

	Residential Units	Office Square Feet	Retail Square Feet	Hotel Rooms	Institutional Square Feet
Lower Manhattan	8,882	5,256,000	253,500	1,263	0
Village	2,911	103,000	575,655	153	200,000
Chelsea	70	1,940,000	0	0	0
Lower Fifth	1,919	0	218,600	0	0
Midtown South	1,850	0	0	0	1,302,000
Clinton	1,010	270,000	30,000	0	0
Garment Center	2,455	2,341,000	1,307,000	854	0
Midtown	1,060	6,396,000	332,000	2,150	278,000
East Midtown	886	2,707,500	1,098,000	135	0
Lincoln Square	2,125	(473,000)*	170,000	167	28,000
Upper East Side	1,365	0	0	0	230,000
Study Area Total	**24,533**	**18,540,500**	**3,984,755**	**4,722**	**2,038,000**

Note: * Net loss of office space due to the conversion of the Gulf & Western Building to residential use.

Source: AKRF, May 3, 1999.

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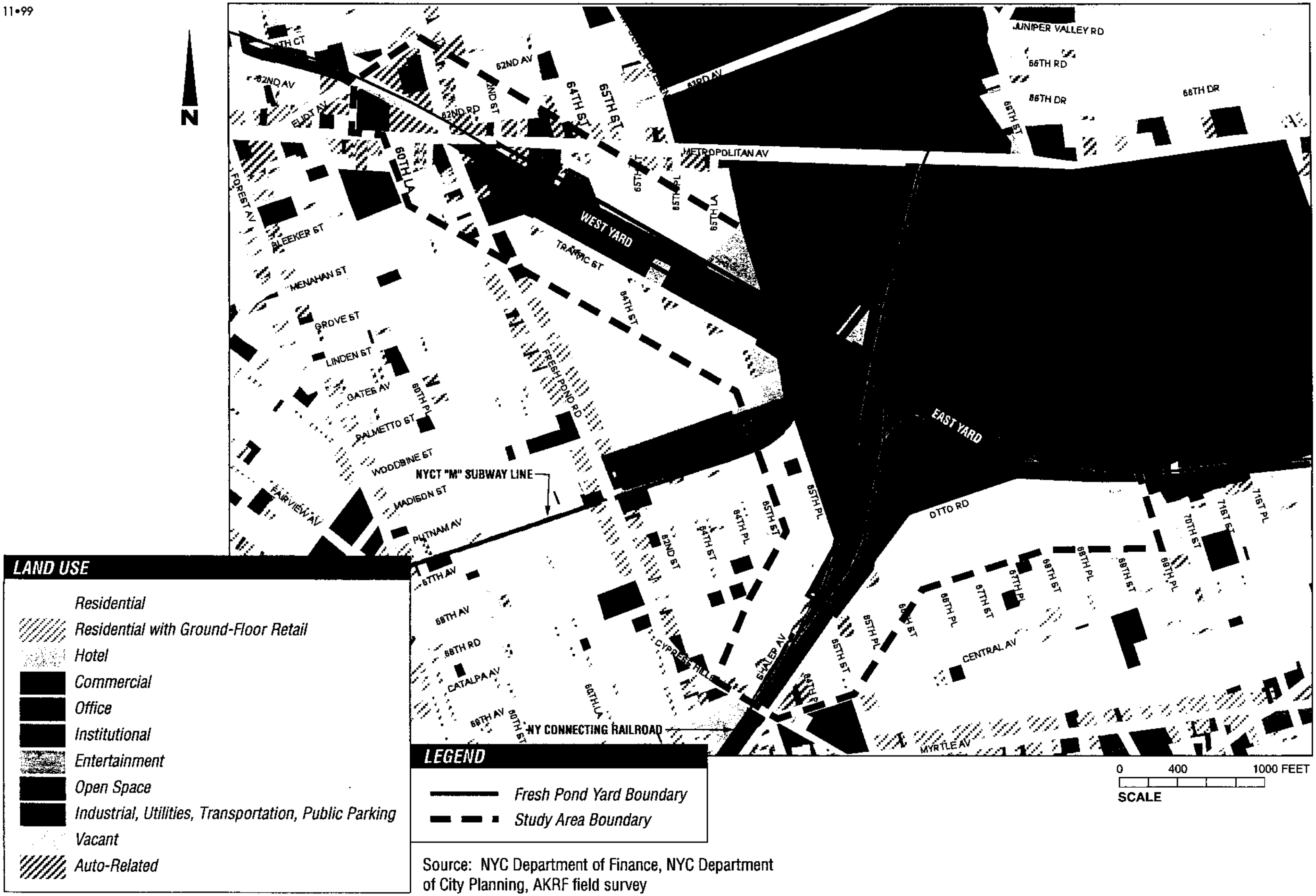

Source: NYC Department of Finance, NYC Department of City Planning, AKRF field survey

Figure 3-9

Land Use: Fresh Pond Yard

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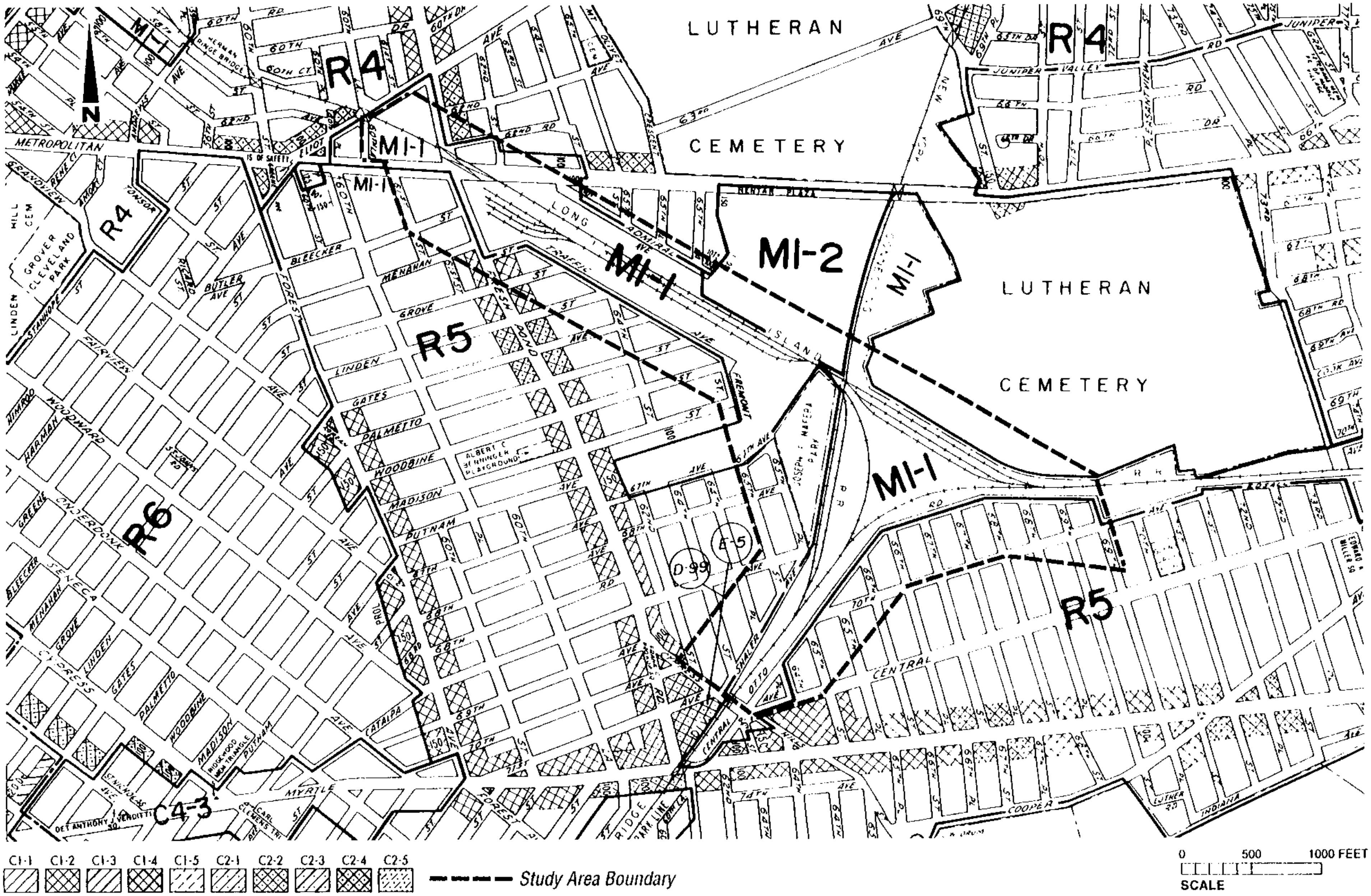
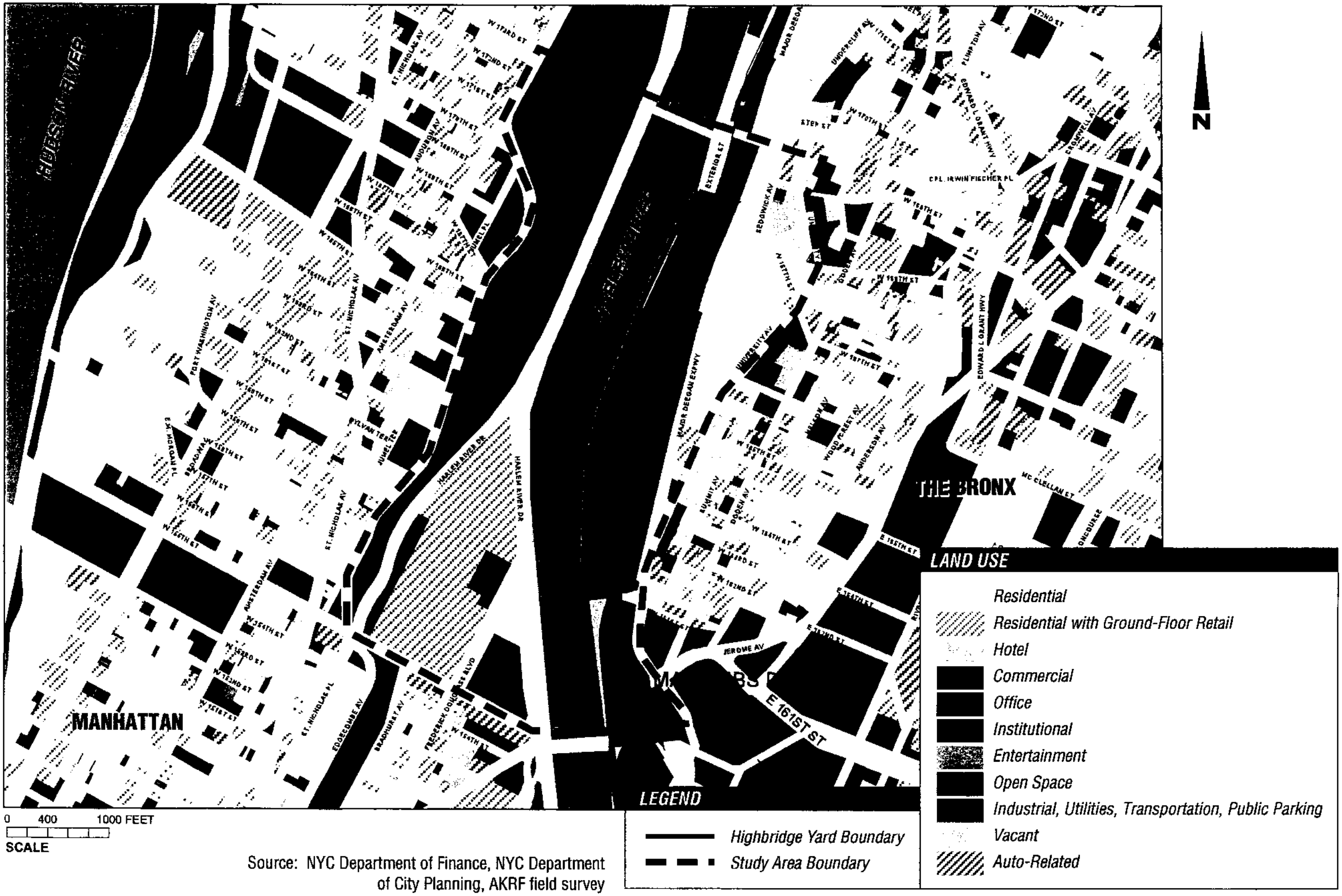


MTA / LIRR

East Side Access

Figure 3-10

Zoning: Fresh Pond Yard



Source: NYC Department of Finance, NYC Department of City Planning, AKRF field survey

Figure 3-11

Land Use: Highbridge Yard

Table 3-4

Known Development Projects in Manhattan Study Area, 2010-2020

	Residential Units	Office Square Feet	Retail Square Feet	Hotel Rooms	Institutional Square Feet
Lower Manhattan	0	2,030,000	0	0	0
Village	0	0	800,000	0	250,000
Chelsea	32	2,180,000	0	400	0
Lower Fifth	1,088	324,000	50,600	0	0
Midtown South	0	0	20,316	0	0
Clinton	2,690	735,000	125,000	0	0
Garment Center	0	1,507,000	20,000	170	0
Midtown	1,566	3,012,000	0	0	0
East Midtown	600	0	0	0	0
Lincoln Square	3,633	1,371,000	667,000	687	2,031,000
Upper East Side	310	0	95,000	0	0
Study Area Total:	**9,919**	**11,159,000**	**1,777,916**	**1,257**	**2,281,000**

Source: AKRF, May 3, 1999.

Although these projects may not all be built in the form in which they are currently proposed, they give a very good indication of the amount of interest in and attractiveness of the study area for future development. Trends in the subareas vary, as discussed below.

LOWER MANHATTAN SUBAREA

In Lower Manhattan, the trend toward a mixed-use, 24-hour community, which is strongly supported by public policy, can be expected to continue. The proposed construction of a new New York Stock Exchange near its current location will help retain Lower Manhattan's core financial district to 2020. The completion of Battery Park City will add more than 6,000 new residential units and approximately 2.5 million square feet of office space.*

VILLAGE SUBAREA

In general, the trends seen today in the large area between Canal and 14th Streets are expected to continue in the future. The conversion of large loft buildings to office use in the "Graphic Arts" section of SoHo (west of Sixth Avenue and roughly south of Houston Street) can be expected to continue. Residential development will continue, through limited new construction, rehabilitation of existing structures, and conversions of loft spaces. The entire area, from river to river, should experience an upgrading of its housing stock as the current strong demand for housing in the subarea is unlikely to wane. Public policy is important here, as well, particularly in the Seward Park and Cooper Square Urban Renewal Areas, where additional housing and retail uses can be anticipated. The Hudson River Park and the completion of the reconstruction of Route 9A (West Street) will significantly change the Hudson River waterfront, augmenting current recreational opportunities and potentially resulting in additional retail development within and just east of the park.

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* Figures include units and space constructed since 1995, and units and space proposed for construction to 2020.

CHELSEA SUBAREA

Development of the Hudson River Park will continue along the Hudson River in Chelsea, providing significant new recreational opportunities. This, along with the reconstruction of Route 9A, should support the continued redevelopment of southern Chelsea's smaller industrial buildings toward galleries and retail-oriented uses. Between Eighth and Tenth Avenues the neighborhood will continue to be strongly residential with scattered new development.

In the northern section of Chelsea, two large development sites over the active tracks and rail yards on Ninth Avenue between 31st and 33rd Streets will likely be developed by 2010 or 2020, as will some of the projects anticipated when the area surrounding the Jacob Javits Convention Center was rezoned. There is also a possibility that the convention center will expand. In addition, the conversion of the General Post Office (Farley Building) to a major Amtrak station and a possible second phase containing more retail and other commercial space can be expected to enliven the area in the vicinity of Penn Station. Consideration of development on the large area above the LIRR yards from Tenth Avenue to Twelfth Avenue is still very speculative; however, by 2020 it is possible that an intense mix of uses could be built there as well.

LOWER FIFTH SUBAREA

Considerable development in the Lower Fifth area can be expected, most specifically along Sixth Avenue between 23rd and 31st Streets, which was recently re-zoned to allow as-of-right residential and large retail uses. This should bring approximately 1,800 new residential units and 140,000 square feet of new retail space to the area. Trends towards intensification of office uses in the blocks between Fifth and Sixth Avenues and along Seventh Avenue in the Garment Center can be expected to continue.

MIDTOWN SOUTH SUBAREA

The recent intensification of office uses and restaurant space in Midtown South will likely continue, and be joined by a similar intensification of residential use. A number of sizable apartment buildings are currently under construction in the East 20's and 30's, ranging in size from 100 to 400 units each. Other notable developments include construction of new institutional space by Baruch College and the redevelopment of the former B. Altman's department store for use as offices and as the Science, Industry and Business Library.

GARMENT CENTER

As the result of the 42nd Street Development Project, a portion of the Garment Center area between 40th and 42nd Streets will continue to experience major changes. In the blocks between Seventh and Ninth Avenues more than 1,000 hotel rooms are planned for construction, along with almost four million square feet of office space and more than one million square feet of retail space. The construction will occur on the south side of 42nd Street between Broadway and Eighth Avenue, with the sites near Broadway slated for office development and the sites at Eighth Avenue for commercial development. In addition, the Port Authority of New York and New Jersey (PANYNJ)is considering proposals for a large development project atop the Bus Terminal on the west side of Eighth Avenue between 40th and 42nd Streets. Situated within

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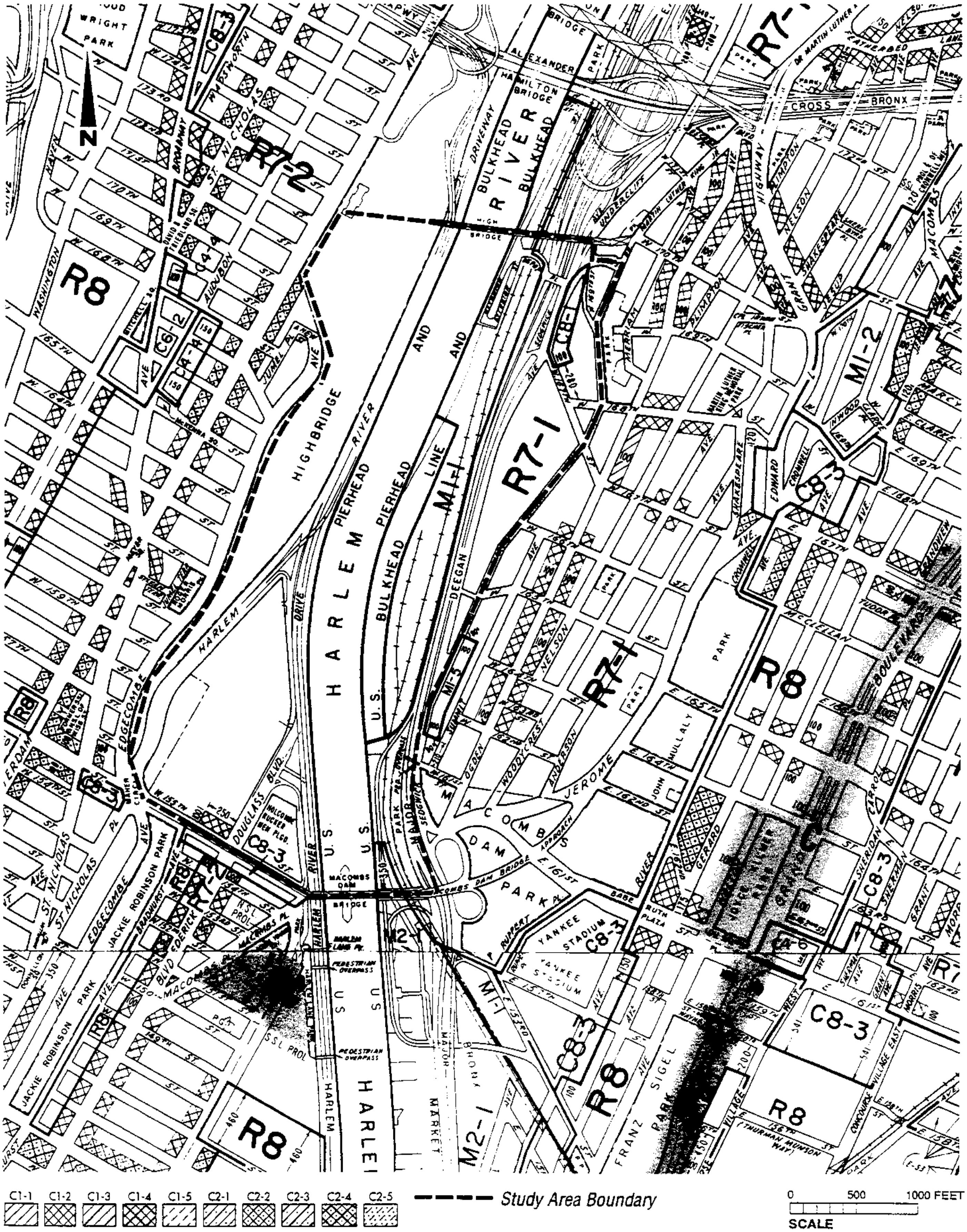

Figure 3-12

Zoning: Highbridge Yard

walking distance of both Penn Station and GCT, these projects in the southern portion of Times Square are likely to serve commuters from both terminals.

CLINTON

While development will continue to move to the western reaches of Midtown, the heart of Clinton will continue to be protected through zoning as a low-scale residential area. The Theater District Rezoning (see discussion of Midtown below), along with the ample number of potential development sites, will bring a select number of larger office or residential buildings to the west side of Eighth Avenue in the 40's. Development sites are still available in the Clinton Urban Renewal Area and will most probably be developed primarily for residential use.

MIDTOWN

Midtown will continue to be a highly desirable area for office space. Development in the eastern portion of this area (east of Sixth Avenue) will continue wherever available sites can be found or assembled. The western portion of the area will see greater development as development sites are still available and the 42nd Street Development Project is very active. The recent Theater District Rezoning, which permits the transfer of unused air rights from theaters to development parcels in a designated area, will support the development of millions of square feet of office and residential space. The creation of more than two million square feet of *additional* space will be allowed through the rezoning, making the development of potential sites in the area much more attractive. A number of these sites are located on the east side of Eighth Avenue.

Two large office buildings are currently under construction or recently completed on 42nd Street and Broadway (Condé Nast Headquarters at 4 Times Square) and 42nd Street and Seventh Avenue (Reuters Headquarters) as part of the 42nd Street Development Project. Other significant projects in Midtown include the construction of a new office building west of Sixth Avenue between 42nd and 43rd Streets (potentially to accommodate Nasdaq), along with new construction of corporate headquarters at 745 Seventh (for Morgan Stanley Dean Witter) and 1739 Broadway (for Random House). Additionally, more than 2,000 new hotel rooms are under construction or in the planning stages, many of which are on 42nd Street Development Project sites and elsewhere in the Times Square area.

Two projects will continue to strengthen the Midtown CBD's appeal as a tourist destination. The expansion of the Museum of Modern Art (MoMA) and the construction of the Folk Art Museum, both on West 53rd Street, will help the area continue to draw visitors from both within and outside the region. Together, these office, residential, and institutional projects will help Midtown continue to grow stronger as a multi-purpose, 24-hour community, consistent with city policies. The strong new development expected in the Midtown subarea would be primarily served by GCT, although passengers coming to Penn Station would be within walking distance of the southern end of the subarea.

EAST MIDTOWN

Like Midtown, the strength of East Midtown as an office district will likely lead developers to aggressively search for development sites in the future, as they have in the recent past. The trend toward dense office development north of 42nd Street in the GCT area will continue, as at least two major sites are developed. The new headquarters of Bear Stearns, at 383 Madison, will occupy the entire block between Madison and Vanderbilt Avenues, 46th and 47th Streets. Made possible through the purchase of GCT's remaining transferable air rights, 383 Madison will bring approximately 1.2 million square feet of office space and draw almost 5,000 employees to the area. A new building currently in the planning stages at 310 Madison, between 41st and 42nd Street, should bring an additional 1 million square feet of commercial or mixed-use space.

In addition, a proposed development at the former Alexander's department store site, occupying the entire block bounded by Third and Lexington Avenues, 58th and 59th Streets, will bring up to 1 million square feet of retail space to the area.

Murray Hill, in the southern section of East Midtown, will continue as a strong residential neighborhood. The Con Edison Waterside generating plant properties along First Avenue in the high 30's will most likely be developed as residential sites.

LINCOLN SQUARE

Lincoln Square will continue to be one of the strongest cultural and institutional centers in Manhattan, and will also continue as a desirable residential area. The completion of Riverside South (now known as Trump Place) along the Hudson River between 59th and 72nd Streets will be the most notable new development, bringing thousands of new residential units to the subarea, along with studio space at its southern end. The subarea will see new office, residential, entertainment, studio, and retail development when the redevelopment of the New York Coliseum site is completed.

UPPER EAST SIDE

The Upper East Side between 59th and 79th Streets will continue to be a strong residential neighborhood, with the construction of a number of luxury high-rise apartment buildings. The high-end retail district of Madison Avenue will continue in its strength. Hospitals and related commercial uses on the eastern side of the area will continue in their present use.

LONG ISLAND CITY/SUNNYSIDE STUDY AREA

In the Long Island City area, the city's plans to create a central business district (CBD) in Long Island City will result in significant changes in terms of land use, zoning, and public policy by 2010. This CBD would be characterized by a dense core of office and other commercial uses that would be well-served by public transportation, and by residential uses surrounding the core. The CBD plans call for a number of rezoning actions in Long Island City just west of Sunnyside Yard. The Special Hunters Point Mixed Use District (to be named the Special Long Island City Mixed Use District and to have three sub-districts) would be expanded and would allow higher density commercial development on certain sites in addition to residential and retail development throughout the area. This rezoning is anticipated to result in the development of an additional 300 residential units, 4 million square feet of office space (in four or five buildings) in close proximity to the location of the proposed new Sunnyside station, new support and destination retail space, and an increase in institutional use. In addition to the creation of new space, it is anticipated that the rezoning will result in the refurbishing and upgrading of approximately 250,000 square feet of office space.

Queens West, a mixed-use development comprising residential and commercial buildings surrounded by landscaped parks and recreational areas, is currently being constructed just outside the study area along the East River in Hunters Point, Queens, directly across from the United Nations in Manhattan. Planned for approximately 74 acres of waterfront land, upon completion Queens West will contain 19 residential, office, and hotel buildings. The project will provide approximately 6,400 residential units, 2 million square feet of office space, 350,000 square feet of hotel space, and 210,000 square feet of retail space. One residential building, City Lights, is completed, and another three are in active planning stages.

Close to Yard A and Sunnyside Yard, several other construction projects are also anticipated for completion before 2010. MTA New York City Transit's 63rd Street Tunnel Connector Project will be completed by 2001, creating an underground subway connection between the Queens Boulevard station at Queens Plaza and the station at Queensbridge/21st Street. Once this work is complete, the project will no longer require use of the large site at Northern Boulevard near 41st Avenue for staging activities. In addition, the New York City Department of Transportation is planning to make improvements at the Queens Boulevard and Honeywell Street bridges over Sunnyside Yard. The work at Queens Boulevard will add pedestrian amenities, among other changes. The work at Honeywell Street will allow vehicular traffic on this bridge, where traffic has been prohibited for some time.

LONG ISLAND

As projected population increases in Nassau and Suffolk (of 17 percent from 1995 to 2020) indicate, Long Island will continue to face strong residential development pressure in the foreseeable future. Similarly strong labor force increases in Nassau and Suffolk (of 31 percent, to 2020) indicate development pressure is likely to be strong on the commercial side also. Both counties are expected to see a continuation of current trends—conversion of open space (and also agricultural land in Suffolk) to primarily residential, retail and commercial space, with Suffolk County, as the less developed entity, receiving more of the development.

YARDS: BLISSVILLE, MASPETH, FRESH POND, AND HIGHBRIDGE

No significant changes in land use, public policy or zoning in Blissville, Maspeth, or Fresh Pond are anticipated.

Some changes may occur in Highbridge. The New York City Department of City Planning's 1993 Plan for the Bronx Waterfront proposed a residential development on a platform over Highbridge Yard. This plan would require a zoning change from M1-1 to R7-1 to permit housing and community-related facilities. The plan also calls for the creation of a public access easement along a vacant six-acre strip of land once used by the Putnam Division railroad, located between Highbridge Yard and the Major Deegan Expressway. This easement is proposed as a bicycle/pedestrian Greenway trail extending as far south as Macomb's Dam Bridge. This proposal, for land just east of the Highbridge Yard, would connect elements of a planned Bronx waterfront esplanade both south and north of Highbridge Yard. None of these plans have progressed since the Plan for the Bronx Waterfront was published, and they may or may not be pursued by 2020.

E. PROBABLE IMPACTS OF THE PROJECT ALTERNATIVES

Transit projects in general tend to support policies that attempt to control sprawl-type development. The historical development of land in New York City and on Long Island demonstrates that mass transit has the capacity to direct development into places where it can most efficiently be sustained. In areas where substantial development has already occurred, transit projects have positive, but less significant effects. Given the highly developed character of the LITC along with the projected growth in population and labor force to 2010 and 2020, it is unlikely that any project alternative, taken alone, will substantially affect land use. Land use patterns in the study areas and subareas are long-established and depend on local zoning initiatives, public policy, tradition, other transportation services, and a host of other factors.

The effects of the No Action Alternative on land use will be adverse in many places, but not significant. The Transportation Systems Management (TSM) Alternative will bring some benefit for land uses, but that benefit will be minor. The Preferred Alternative, by providing efficient transportation to residents of Long Island and employees in Manhattan, will be the most beneficial in that it will support land use policies throughout the corridor that seek to re-center communities and improve access to workplaces.

NO ACTION ALTERNATIVE

Overall, the No Action Alternative would have negative effects on land use and development throughout the LITC. The increases in population and employment—and the development to support these increases—predicted for 2010 and 2020 are based on the assumption that transportation services would not deteriorate during this time. If under the No Action Alternative transportation service does indeed deteriorate (see also Chapter 9, "Transportation"), then the anticipated growth may not be achieved. In specific study areas, the No Action Alternative would result in adverse—but not significant—effects on land use in all but the yard study areas. Throughout the LITC, the No Action Alternative would perpetuate the imbalance between the center of the Midtown CBD and the location of the LIRR terminus. In the Manhattan study area, street and sidewalk congestion in Midtown would increase as greater numbers of passengers alight at Penn Station make their way across town. This would make the area somewhat less "livable" and attractive. However, since LIRR commuters do not make up a large percentage of east-west movements, the increase in their numbers alone is not likely to affect land use patterns measurably.

In Long Island City/Sunnyside, the No Action Alternative would not support city policy in establishing a fourth CBD in Long Island City. Without the addition of a new Sunnyside station, access to the new CBD would not be facilitated.

On Long Island, the No Action Alternative would perpetuate current and future trends to site new development in areas served by the automobile. It would not support transit-centered land use, nor would it assist in containing sprawl. Without improvements to the rail system, commuters would be discouraged from taking the LIRR to their workplace in Manhattan, contributing to increasing congestion on the area's highways and, perhaps, development of new office centers away from Manhattan. In addition, it is on Long Island that the potential for development (or lack of development) would be most apparent. Under the No Action Alternative, it is possible that growth and development predicted for Nassau and Suffolk Counties would not be fully achieved.

The No Action Alternative would not affect any of the yard study areas. The yards would continue to be lightly used for rail freight activity.

TRANSPORTATION SYSTEMS MANAGEMENT (TSM) ALTERNATIVE

The TSM Alternative includes three components to maximize the utility of the current transportation system (see Chapter 2, "Project Alternatives"). These components would not have significant adverse impacts on land use, zoning, or public policy, as follows:

- Increasing the number of LIRR rail cars during the rush hours. While this would require the construction of additional platform and track space at some stations, no new rights-of-way would be needed and no existing land uses would be altered.
- Increasing the number of trains serving the Hunterspoint and Long Island City stations. As discussed at the beginning of this chapter, the patronage at these stations that would be affected by the project comprises transfers from LIRR to subway only. The projected AM peak period increase in passenger use of these two stations as a result of the TSM Alternative (approximately 1,500 at Hunterspoint, fewer than 100 at Long Island City in 2020), would not have any effect on land uses around the stations. A TSM component related to this increased train service, increasing ferry service between Long Island City and Manhattan, would support the new Queens West development, but would not require changes in or have impacts on existing land uses. Similarly, the construction of a covered pedestrian walkway linking the LIRR Long Island City station to the ferry terminal would not impact land uses, nor would the construction of an underground connection between the LIRR and the subway at Hunters Point.
- Extending the length of the westbound LIE contra-flow lane by 3.6 miles would not adversely affect land uses, because no new right-of-way would be required as a result of the extension.

However, although it would not result in any local land use impacts, on a more regional scale, the TSM Alternative would be similar to the No Action Alternative in that it would fail to provide a direct transportation link for commuters bound for East Midtown. The TSM Alternative would thus perpetuate the imbalance between the center of the Midtown CBD and the location of the LIRR terminus. The TSM Alternative would also represent a lost opportunity to support development trends and public policy in Long Island City.

PREFERRED ALTERNATIVE

The Preferred Alternative, creating a new LIRR terminal in GCT, would support regional land use patterns in the future (2010 and 2020) by better serving uses throughout the LITC and by supporting stated goals of encouraging the concentration of future development in established areas with adequate infrastructure and facilities. With the Preferred Alternative, there would be no rail transit deterrent to achieving predicted growth in the LITC. On a local level in Manhattan, Long Island City/Sunnyside, and Long Island, the Preferred Alternative would also be beneficial, as discussed below.

MANHATTAN STUDY AREA

The Preferred Alternative would support land use patterns by substantially improving transportation service to East Midtown, the core of the city's Midtown CBD. As described in more detail in Chapter 5, "Economic Conditions," the Preferred Alternative would support the CBD by providing a direct connection for workers to their place of business, making transportation in Manhattan more efficient.

Overall, the Preferred Alternative would improve access to the Manhattan study area and is therefore compatible with land uses and public policies throughout the study area. More specific effects would be felt in the areas around and between Penn Station and GCT, described below.

At GCT, the Preferred Alternative would add nearly 66,000 passengers in the AM peak period. As discussed in Chapter 9, "Transportation," these commuters would increase congestion on sidewalks and increase traffic in the area immediately surrounding the terminal and its exits. This effect would dissipate rapidly, since these "new" passengers would not be new to the area at all. In the No Action and TSM Alternatives, the vast majority of these commuters would arrive at Penn Station or come by car or bus, but would be destined for the same place of work as that of the riders in the Preferred Alternative. The limited congestion in the terminal itself and the immediate surroundings would not be enough to make actual changes in land use patterns, which are well-established and very intense in East Midtown.

The decrease in patronage at Penn Station would also not be enough to affect land use patterns. With fewer LIRR riders, some of the retailers inside the terminal and in the area of the travel path to work might see a decrease in sales. As discussed in Chapter 5, "Economic Conditions," given the overall increases in ridership on Amtrak and NJ Transit, the sales effect of the LIRR's change in passenger volumes would not be enough to alter land uses or land use patterns.

By bringing passengers closer to their destinations, the Preferred Alternative would eliminate east-west pedestrian, vehicular, and transit trips in Midtown. This would have the effect of somewhat reducing the intense activity and congestion on streets, particularly the smaller streets, in this area. This beneficial effect would improve neighborhood character, as discussed in Chapter 4, "Social Conditions." However, the congestion reduction is not expected to be large enough to encourage a change in land use patterns or in city policy to permit more intense uses in the area.

The Preferred Alternative calls for the creation of five additional entrances to new LIRR platforms to allow access to the platforms from north of GCT. These entrances would not change land use patterns in the area. Details on easements required for construction of these entrances can be found in Chapter 5.

The project would require the acquisition of a five-story office building in the Manhattan study area, at 47 East 44th Street. Replacement of this building with a railroad-related structure would change land use at that location, but would not change land use patterns in the area. Details on property to be acquired can be found in Chapter 5.

LONG ISLAND CITY/SUNNYSIDE STUDY AREA

The new station at Sunnyside would support existing and future development of the Long Island City/Sunnyside area. The area surrounding the proposed station has traditionally been a rail facility and would continue as such, with the addition of a new station to bring people to and from the area. The station would be consistent with New York City's stated intentions to develop Long Island City as its fourth central business district (see discussion of land use changes above), improving access between Nassau and Suffolk Counties and Long Island City.

The new station would be located within ¼ mile of the area where the majority of the new office development is expected in Long Island City and, therefore, would serve the workers in the new CBD. It would also be close to the institutional uses south of Sunnyside Yard along Thomson Avenue and Queens Boulevard.

The Preferred Alternative would require the acquisition of two industrial properties in the Long Island City/Sunnyside study area, on Northern Boulevard (see Chapter 5, "Economic Conditions"). This would not change overall land use patterns in the study area.

LONG ISLAND

Overall, the Preferred Alternative would have beneficial effects on land use on Long Island. By improving transportation service for commuters who work in Manhattan, it would encourage use of mass transit and reduce congestion on the area's highways, resulting in improved access to land uses on the Island. The Preferred Alternative would clearly support general county land use policies which seek to concentrate future growth in established areas, to make efficient utilization of the transportation network, and to revitalize existing town centers. Approximately half of the 30,000 new LIRR passengers would switch from driving cars to work to taking the train. This would support land uses around local train stations and focus development on town centers, promoting a more efficient and centered land use pattern. As noted above, with this alternative there would be no rail transit deterrent to achieving predicted growth on Long Island. The development thus made possible by the Preferred Alternative would likely be more focused on town centers and less of the urban sprawl type.

As in Manhattan, overall development patterns on Long Island are not expected to change as a result of the Preferred Alternative. As Nassau and Suffolk are primarily residential counties, choice of residential location is the driving force behind land use trends. The Preferred Alternative would improve commuting times into East Midtown Manhattan—a factor that plays a role in influencing where residents choose to live. Commuting time is, however, only one considerations among many when people choose where to live. Significant considerations include the quality of the local schools, the cost of housing and local property taxes, the character of the neighborhood, and a host of quality-of-life factors like the local traffic situation, accessibility to shops and restaurants and entertainment, etc.

The development of Nassau and Suffolk Counties was initially significantly influenced by the LIRR. However, while the Preferred Alternative would improve the quality of service for a number of current and future LIRR customers in Nassau and Suffolk, it would not add new stations or service where there would otherwise be none. In addition, any land use impacts brought about by the Preferred Alternative's attraction of approximately 30,000 passengers to the LIRR would be overshadowed by the two counties' overall population and labor force growth. As such, the Preferred Alternative, taken alone, would not have significant direct or indirect impacts on land use patterns.

YARD STUDY AREAS

Blissville Yard

Under the Preferred Alternative, Blissville Yard could be used for rolling stock storage of NYAR freight cars. This would create new freight activity in the rail yard, which is currently unused. It would not, however, alter or conflict with surrounding land uses in the area. Overall, land uses in the Blissville Yard study area would not be significantly affected by the Preferred Alternative.

Maspeth Yard

Under the Preferred Alternative, Maspeth Yard, currently an active rail yard for NYAR, could be used for rolling stock storage of NYAR freight cars. This would increase rail freight activity at the yard, which is currently lightly used, but would not change the basic land use of the yard. The increase in activity would not result in conflicts with surrounding land uses. Rail freight activity is compatible with the industrial uses that predominate in the study area. The change in activity at the yard would not adversely affect the small residential area that abuts the yard. The character of this area is already affected by the presence of the yard (see Chapter 4, "Social Conditions," for a discussion of neighborhood character), so land use patterns would not be likely to change. Overall, land uses in the Maspeth Yard study area would not be significantly affected by the Preferred Alternative.

Fresh Pond Yard

Fresh Pond Yard could be used for locomotive and rolling stock maintenance of NYAR freight cars. In the center of the East Yard, at the site of the current NYAR offices (which occupy a double-wide trailer), a new combined maintenance facility and office of approximately 6,000 square feet would be constructed and approximately 10,000 square feet of surface would be paved and embedded with rails.

The increased rail freight activity at Fresh Pond Yard and the new building in the center of Fresh Pond's East Yard would not adversely affect surrounding uses. As described under "Existing Conditions," Fresh Pond Yard is buffered from nearby residential uses in most locations by industrial buildings. At the limited locations where residential uses or Mafera Park abut the yard, the new facility would not be visible. The increase in rail freight activity would not be significant relative to the rail movements already occurring in the immediate area—a combination of NYAR, other freight, and NYCT subway trains. Overall, the Preferred Alternative's use of Fresh Pond Yard would not result in changes to the character of the surrounding neighborhood (see Chapter 4, "Social Conditions") and therefore would not be expected to result in changes to land uses or land use trends in the study area.

Highbridge Yard

Highbridge Yard would be used for midday storage of MNR trains displaced from the Madison Yard. All new facilities to be constructed (see Chapter 2, "Project Alternatives") would be within the yard. As described earlier, surrounding residential uses and other sensitive uses—including schools and parks—are some distance away and well-buffered from the yard by intervening highways and, for some of the study area, by the Harlem River. Overall, the more intensive use of the Highbridge Yard by the Preferred Alternative is not expected to result in any changes to land use or land use trends in the surrounding study area.

Should the Department of City Planning's proposal set forth in the 1993 Comprehensive Waterfront Plan, for residences on a platform north of Highbridge Yard, ever move forward, the Preferred Alternative would not adversely affect such a plan. The 1993 proposal was conceptual, and a more detailed plan would have to accommodate any rail uses in the yard. The re-use of Highbridge Yard for rail freight activity would not conflict with the proposed use of the abandoned rail right-of-way to the east for a bicycle/pedestrian path.

MITIGATION

No significant impacts on land use, zoning, or public policy are anticipated for the project's alternatives and, therefore, no mitigation would be required.

⁂

Chapter 4: Social Conditions

A. INTRODUCTION

This chapter addresses a variety of issues related to social conditions in the LIRR ESA Project study areas—including general neighborhood character, community facilities, and relevant population and labor force characteristics. The East Side Access Project has the potential to affect social conditions if it results in a change in neighborhood character (by introducing new land uses, for example), adversely affects community facilities (for example, by reducing access to a facility), or has adverse impacts on the local population. The discussion of social conditions focuses on the same study areas in Manhattan, Queens, and Long Island that are assessed in Chapter 3, "Land Use, Zoning, and Public Policy." For each study area, the existing conditions are assessed, including an evaluation of neighborhood character, identification of community facilities, and assessment of population characteristics. The expected changes in the future are then considered, followed by an evaluation of each alternative's effects on social conditions in the analysis years 2010 and 2020.* The future without the proposed project ("No Action" Alternative), the TSM Alternative, and the Preferred Alternative are analyzed to show the probable impacts of each alternative. As in Chapter 3, "Land Use, Zoning, and Public Policy," each discussion of existing conditions, changes expected to occur in the future without the project, and probable impacts of project alternatives begins with a regional overview and is followed by a discussion of the study areas in Manhattan, Long Island City/Sunnyside, Long Island, and affected rail yards.

B. EXISTING CONDITIONS

LONG ISLAND TRANSPORTATION CORRIDOR OVERVIEW

The Long Island Transportation Corridor (LITC), encompassing Manhattan and all of Long Island (Nassau and Suffolk Counties and Brooklyn and Queens), is a large, varied metropolitan subregion, stretching for approximately 122 miles east-west, from the Hudson River to the tip of Montauk Point. At the western end of this area is Manhattan, with its dense core of activity. Manhattan is characterized by its famous skyline, bustling Times Square and surrounding Theater District, commerce on Wall Street, the hustle of the Garment Center, fashionable shopping districts, and mix of residential neighborhoods—some ethnic, some historic and most very dense. Queens and Brooklyn, across the East River, are home to an extraordinarily varied mix of ethnic groups in established neighborhoods, less dense than Manhattan, but, with a few exceptions, still very urban in character. These boroughs also contain thriving downtown centers, major industrial areas, a vast agglomeration of transportation infrastructure (including the city's two major airports), Shea Stadium, the National Tennis Center, and several major parks and beaches.

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* Sources for population and housing data are the 1980 and 1990 *Census of Population and Housing* and New York Metropolitan Transportation Council's (NYMTC) population forecasts for 1995, and projections for 2000, 2010, and 2020. The inventory of community facilities is based on the *Community District Needs 1998* for Manhattan and Queens Community Boards and supplementary information gathered for the analysis of land use, zoning, and public policy (in Chapter 3, "Land Use, Zoning, and Public Policy"). The assessment of neighborhood character is based on information gathered for other studies, particularly the analysis of land use.

Countywide projections were prepared for NYMTC by Urbanomics. Projections were made for MTA planning districts by preparing subcounty allocations of the countywide totals. Most of these subcounty allocations were prepared for MTA Long-Range Planning Framework by URS, September 18, 1997. For Manhattan, the Queens study area, and downtown Brooklyn, updated forecasts were prepared for the Long-Range Planning Framework by AKRF, Inc. in May 1999.

The character of the LITC becomes progressively more suburban as one moves eastward into Nassau County, the denser and older of the two suburban counties, with urbanized town centers and a variety of housing types, ranging from the estates of its northern hills to post-World-War II tract housing, the most famous of which is Levittown. Suffolk County, developed later, is strongly suburban in its western end; to the east, however, the suburban development gives way to farms and wineries, fishing ports, and a substantial number of vacation homes. Both counties are known for the extraordinary beaches that line the Island's bays, sound, and ocean shores.

The LITC is home to a substantial population—an estimated 8,405,400 in 1995—and a large labor force—estimated at 3,590,620 in 1995. The LIRR runs east-west through the LITC, serving commuters and those visiting other regional attractions, such as shopping, theaters, museums, sports and other events, parks, beaches, universities, and medical centers. Although the LIRR played a strong role in shaping the character of development on Long Island from the mid-19th to mid-20th century (see discussion in Chapter 3, "Land Use, Zoning, and Public Policy"), it has been less significant to the LITC's character through the waves of post-World-War II development centered around the automobile as a primary means of transportation. Nonetheless, the LIRR remains a valuable and important transportation resource in the LITC, supporting a host of activities and conditions relevant to the social and community character of the project's study areas.

As shown in Table 4-1, the residents of the LITC work predominantly at jobs in Manhattan, elsewhere in New York City, and on Long Island. Some 22.1 percent (275,947 people) of the Long Island labor force commutes to New York City for work, and 10.3 percent commutes to Manhattan for work. Those Long Island residents make up 6.9 percent of the total work force in Manhattan and 7.9 percent of the total work force in New York City. Conversely, some residents of the New York City portion of the LITC commute to Long Island for work. In total, an estimated 79,489 people commute from Manhattan, Brooklyn, and Queens to Long Island for work. These workers make up 7.5 percent of the workforce on Long Island.

The neighborhood character, community facilities, and population characteristics of each project study area are described below.

MANHATTAN STUDY AREA

NEIGHBORHOOD CHARACTER AND COMMUNITY FACILITIES

The Manhattan study area is the most densely developed mixed residential and commercial area in the country. Commercial districts are located next to residential districts with significant crossover of uses in each area. Different neighborhoods in Manhattan south of 79th Street vary

Table 4-1
LITC 1995 Labor Force by Employment Location

		Location of Employment					
		Manhattan		Other NYC		Long Island	
Location of Residence	Total Labor Force	Workers	Percent of Manhattan's Work Force	Workers	Percent of NYC's Work Force	Workers	Percent of LI's Work Force
Nassau County	643,677	96,676	5.1%	109,007	6.6%	424,598	39.6%
Suffolk County	624,795	35,112	1.8	39,382	2.4	543,200	50.7
Nassau & Suffolk	**1,268,472**	**131,789**	**6.9%**	**148,389**	**9.0%**	**967,798**	**90.3%**
Manhattan	675,243	560,801	29.4	72,457	4.4	7,597	0.7
Queens	866,641	318,051	16.7	456,906	27.8	62,536	5.8
Brooklyn	835,729	291,474	15.3	510,627	31.1	10,796	1.0
NYC portion of LITC	2,377,613	1,170,326	61.3	1,039,990	63.3	80,929	7.6
LITC	**3,646,085**	**1,302,114**	**68.3**	**1,188,379**	**72.3**	**1,048,727**	**97.9**
Total Work Force		**1,907,021**	**100.0%**	**1,643,029**	**100.0%**	**1,071,335**	**100.0%**

Note: This table presents employed trip-based labor force and trip-based work force which do not include those who work at home. Employed labor force consists residential population that works (outside the home); work force consists of employees, at their workplace.

Source: Journey-to-Work Forecasting and Analysis, Urbanomics/NYMTC, September 27, 1995 as used in MTA Long Range Planning Framework Projects: MESA, ARC, LIRR/ESA.

widely in character. There are the dense commercial business districts of Lower Manhattan and Midtown, where the streets are lined with tall office buildings and busy with traffic and pedestrians, and the retail districts along avenues throughout the study area, including Sixth Avenue in Chelsea, and at Herald Square and Fifth and Madison Avenues in Midtown. The study area also contains some of the most expensive and luxurious housing in the region (e.g., Sutton Place, Park and Fifth Avenues), and some of the most impoverished (e.g., Lower East Side). Types of housing involve high-rise apartment towers, bulkier and shorter masonry buildings of the pre-War era, mid-rise brick apartment buildings, tenements, brownstones, and row houses. Neighborhood character varies from the historic small-scale Greenwich Village to the newer high-rise developments on the Upper East Side. Many neighborhoods clearly show their mix of incomes, for example, the Lower East Side and Chelsea contain mixes of low-rise older residential and industrial buildings and large blocks of public housing. The study area is served by rail, subway, bus, and taxi, providing local and regional access.

Midtown contains a dense office district from Third to Sixth Avenues, with a major shopping area along Fifth Avenue. The historic Grand Central Terminal (GCT) lies in the heart of the midtown Manhattan commercial core, an active area of offices, shops, hotels, urban plazas, and other uses that define the surrounding urban environment. There are shops and restaurants at street level on all sides of the GCT superblock and on the blocks between Vanderbilt and Madison Avenues. Many travelers using GCT are commuters working in large nearby office buildings, such as the Metropolitan Life Building, Chrysler Building, Helmsley Building, and Graybar Building. Concentrated along 42nd Street and Park and Madison Avenues, these offices and their many employees give a distinctive "corporate" quality to the area. North of GCT, Park

Avenue is a broad two-way boulevard with a wide landscaped median that is home to corporate headquarters for companies such as Bear Stearns and Chase Manhattan Bank. The avenue is also the location of several renowned landmarked structures: the Waldorf-Astoria Hotel, Saint Bartholomew's Church, the Racquet and Tennis Club, and Lever House and the Seagram's Building, two early and fine examples of steel and glass "tower-on-plaza" architecture (for more information, see Chapter 7, "Historic Resources"). Some of these plazas serve as open spaces for workers in the area during the day.

To the west, Madison and Fifth Avenues comprise a major shopping district, with Saks Fifth Avenue, Tiffany, Fortunoff, and a number of upscale boutiques and related shops. At Lexington Avenue and 59th Street is Bloomingdale's, the anchor of another important shopping district.

Manhattan is famous for its major regional community facilities and institutions, including museums, concert halls, parks, medical centers, and religious institutions. Closest to GCT are the Museum of Modern Art, the New York Public Library Research Center, the United Nations, the theaters of Times Square, the hospitals of East Midtown (New York University Medical Center and Bellevue Hospital) and the Upper East Side (New York University-Cornell Medical Center, Memorial Sloan-Kettering Cancer Center), and East Side institutions such as Hunter College and Rockefeller University. Farther north on the Upper East Side (and outside the study area, but important destinations for visitors to Manhattan) are the numerous museums of Museum Mile (the Metropolitan Museum of Art, the Jewish Museum, the Cooper-Hewitt Museum, the Solomon R. Guggenheim Museum, El Museo del Barrio, the Museum of the City of New York, etc.). Institutions on the West Side or near Penn Station include Lincoln Center for the Performing Arts, Carnegie Hall, Madison Square Garden, and St. Luke's-Roosevelt and New York Presbyterian Hospitals. Farther north (and outside the study area), the West Side is home to the American Museum of Natural History and, still farther, Columbia University.

Despite its dense commercial core, as described in Chapter 3, "Land Use, Zoning, and Public Policy," Manhattan includes many residential neighborhoods between and outside its two commercial areas (see Figure 3-2). The population in those neighborhoods is described below.

POPULATION CHARACTERISTICS

As shown in Table 4-2, the Manhattan study area includes nearly 648,000 residents—about 42 percent of the total population of Manhattan (1995 population estimates). Some 8 percent of the LITC's population lives in the Manhattan study area. Most of these study area residents live in the Village and Midtown South subareas, which are the largest subareas in terms of acreage (see Figure 3-1 in Chapter 3, "Land Use, Zoning, and Public Policy," for a map of the subareas). As shown in the table, the majority of the residents in the Manhattan study area are white, and the 1989 median household income (reported in the *1990 U.S. Census of Population and Housing*) is nearly $42,000, with 14.7 percent living below the poverty level. Minority populations are concentrated in Lower Manhattan (this area, which includes most of Chinatown, has an Asian population of 40 percent), the Village, Chelsea, the Garment Center, and Clinton. A relatively high percentage of the population lives below poverty level in Lower Manhattan, the Village, Chelsea, and the Garment Center. Overall, the percentage of low-income residents in the Manhattan study area is slightly higher than in the LITC, but lower than in Manhattan as a whole or in New York City.

Table 4-2

Manhattan Study Area Population Characteristics, 1990 and 1995

			Selected Demographic Characteristics, 1990						
				Race and Ethnicity (Percent)				Economic Profile	
Area	1990 Population	Estimated 1995 Population	Percent of Study Area	White	Black	Asian	Hispanic*	1989 Median Household Income**	Below Poverty Level*** (Percent)
Lower Manhattan	45,069	47,487	7.1%	45.5%	8.3%	40.3%	10.2%	$38,086	17.7%
Village	232,603	235,814	36.5%	60.3	8.6	19.5	23.1	$30,679	21.6
Chelsea	25,443	25,551	4.0%	76.7	11.3	3.4	25.2	$30,619	14.7
Lower Fifth	27,298	27,592	4.3%	82.4	7.6	6.0	14.1	$37,380	12.9
Midtown South	86,731	87,819	13.6%	83.0	6.9	7.4	8.4	$43,543	9.4
Garment Center	5,890	5,980	0.9%	56.9	31.9	6.2	35.1	$33,123	40.8
Clinton	37,807	38,176	5.9%	73.9	9.4	7.0	23.9	$28,448	16.5
Midtown	14,569	14,690	2.3%	82.1	8.7	6.4	7.9	$39,646	13.4
Midtown East	63,409	64,720	9.9%	88.6	2.4	7.5	4.5	$53,232	6.0
Lincoln Square	29,035	29,600	4.6%	82.2	9.7	4.5	10.5	$51,147	9.3
Upper East Side	69,745	70,383	10.9%	92.9%	2.1%	4.2%	4.0%	$65,095	4.7%
Total Study Area	**637,599**	**647,812**	**100.0%**	**72.6%**	**7.4%**	**13.4%**	**15.2%**	**$41,499**	**14.7%**
Total Manhattan	**1,487,536**	**1,509,996**	**—**	**58.3%**	**22.0%**	**7.4%**	**26.0%**	**$32,262**	**20.5%**
Total NYC	**7,322,564**	**7,348,600**	**—**	**52.3%**	**28.8%**	**7.0%**	**23.7%**	**$29,823**	**18.9%**
Total LITC	**8,349,010**	**8,394,177**	**—**	**64.5%**	**21.8%**	**6.2%**	**16.3%**	**$36,300**	**13.8%**

Notes:

* An ethnic group that can include members of all different racial categories.

** The median household income reported for the study area is a weighted average of those reported for the census and/or block groups in the study area. The median household income for the LITC is a weighted average of those reported for the counties in the LITC.

*** Percent of persons with incomes below the established poverty level; poverty level varies depending on household size.

Sources: 1990 figures are from the U.S. Department of Commerce, Bureau of Census, *U.S. Census of Population and Housing*, 1990. 1995 forecasts are from NYMTC.

LONG ISLAND CITY/SUNNYSIDE STUDY AREA

NEIGHBORHOOD CHARACTER AND COMMUNITY FACILITIES

The Long Island City/Sunnyside study area includes commercial, industrial, residential, and educational uses, making it both an origin and destination point throughout the day. The study area is well served by roads, subways, and buses, but it is not particularly accommodating to pedestrians. Those sections of the area that do not contain major arteries leading to and from the Queensboro Bridge or the Queens-Midtown Tunnel, or across Sunnyside Yard, are quieter, but even these usually contain truck docks or curb cuts that make walking difficult.

As described in Chapter 3, "Land Use, Zoning, and Public Policy," the Long Island City/Sunnyside study area is primarily commercial and industrial near the site of the proposed Sunnyside station, and residential at the edges of the study area. As shown in Figure 4-1, the study area includes portions of four different neighborhoods. South of Sunnyside Yard, the far western edge of the tree-lined Sunnyside residential neighborhood is included in the eastern portion of the study area. Dutch Kills lies north of the eastern part of Sunnyside Yard and is a mixed industrial and residential use neighborhood where sidewalks are generally uneven and unkempt, landscaping in front of houses or apartments is scarce, and street life is limited. Additionally, isolated residential pockets are located north of Sunnyside Yard in Long Island City.

The study area south of Sunnyside Yard in Long Island City is primarily industrial, typified by loft and low industrial buildings on open streets with few trees or pedestrians. An exception is the area along Thomson Avenue and Queens Boulevard, where there is a concentration of institutional and commercial offices located in large converted manufacturing buildings, including LaGuardia Community College, the Aviation High School, and the International Design Center of New York, or IDCNY (now predominantly occupied by office uses).

Sunnyside Yard and Yard A bisect the middle of the study area, forming the center of a large industrial area. These train yards are actively used for storage and maintenance of a large number of trains. The two yards, roughly between Skillman Avenue and Northern Boulevard, are predominantly below the grade of surrounding streets and surrounded by large industrial buildings (and, in some locations, fencing). Therefore, the yards are not visible from most of the surrounding study area. Bridges cross the yards at Queens Boulevard, Thomson Avenue, Honeywell Avenue, and 43rd Street, connecting the areas to the north and south and providing some views into the yards.

Long Island City is known for its large industrial lofts occupied by factories and warehouses and for the elevated N and No. 7 trains that wind above the streets. However, among the many commercial and industrial buildings are scattered row houses and the historic Hunters Point residential district, about ¾ of a mile from the proposed site for the new Sunnyside station. At the intersection of Thomson and Jackson Avenues just north of the yards, the 49-story Citibank tower, which dominates the Long Island City skyline, and the Queens Court House Square lend a corporate feel to the immediate area. Although recent development has occurred south of Queens Plaza, Court Square is still the study area's major commercial and transportation center. Silvercup Studios and P.S. 1 Museum of Contemporary Art in Long Island City (just outside the study area), along with smaller art galleries and studios, make the area a locus of creative production.

Noise levels in the study area are consistent with other urban areas. Industrial pockets tend to be intermittently noisy with large trucks and machine operation. Traffic is a significant source of noise for the area, particularly along Jackson Avenue and Queens and Northern Boulevards. Traffic is particularly heavy during the morning and evening rush hours, since the area is used to access the Queensboro Bridge, Queens-Midtown Tunnel, and regional highways.

Many of the community facilities in the Long Island City/Sunnyside study area are public and private schools (see Table 4-3 and Figure 4-1). LaGuardia Community College, located on Thomson Avenue just west of Queens Boulevard, is a two-year college that is part of the City University of New York and that draws students from around the city. An associated middle school and high school are in the same building. Other prominent community facilities include the 11th District Courthouse, located north of the yard at Court Square (at Jackson and Thomson Avenues). Additionally, there is a state correctional facility located in a primarily industrial area two blocks south of the yard.

Table 4-3
Long Island City/Sunnyside Study Area Community Facilities

Map No.	Name	Address
1	I.S. 235 Academy of New Americans	28-04 41st Avenue
2	Aviation High School	36-02 Queens Boulevard
3	International High School	31-10 Thomson Avenue
4	Queens Vocational High School	37-02 47th Avenue
5	Academy of American Studies/The Renaissance School	28-01 41st Avenue
6	Evangel Christian School	39-21 Crescent Street
7	Robert F. Wagner Jr. Institute for the Arts	30-00 47th Avenue
8	St. Raphael School and Church	48-25 37th Street
9	Academy of American Studies/LIC High School	28-01 41st Avenue
10	Fiorello LaGuardia Community College (CUNY)	31-10 Thomson Avenue
11	Middle College High School	31-11 Thomson Avenue
12	Church of God	22-48 Jackson Avenue
13	Korean Phillips Presbyterian Church	40-09 Northern Boulevard
14	St. Patrick's Church	39-42 40th Avenue
15	Gospel Tabernacle Church	39-21 Crescent Street
16	Queens State Correctional Facility	31-28 31st Place
17	Group Home	42-25 27th Street
18	Greek Cultural Center	38-11 27th Street
19	HRC NYC New Projects Training School	32-03 39th Avenue
20	Cultural Center	43-15 39 Street
21	YMCA	27-04 41st Avenue
22	11th District Courthouse	25-10 Court Square
23	Fire Department: Engine 261	37-20 29th Street
24	Fire Department: Engine 259	48-67 Hunters Point Avenue
25	Court House Square	Jackson-Thompson Avenues, Court Square
26	Tournsey Playground	96 Skillman Avenue
27	Queens Symphony Orchestra	31-00 47th Avenue

POPULATION CHARACTERISTICS

Although not primarily residential in character, the Long Island City/Sunnyside study area includes a small residential population of some 6,300, less than 1 percent of the population of Queens. Based on information from the 1990 census, income levels are, on average, low within the study area, with the median income approximately $27,000 (see Table 4-4). Areas with the lowest median annual income are located in the northwestern, Long Island City portion of the study area. In 1990, black residents constituted approximately 6 percent of the study area's population, much less than in Queens or the LITC as a whole (both at 22 percent), while the percentage of Asian and Hispanic residents (19 and 40 percent, respectively) was higher than in Queens as a whole or in the entire LITC.

Table 4-4
Long Island City/Sunnyside Study Area 1990 Population Characteristics

		Race and Ethnicity (Percent)				Economic Profile	
Portion of Study Area[1]	**Population**	**White**	**Black**	**Asian**	**Hispanic[2]**	**1989 Median Household Income[3]**	**Below Poverty Level[4]**
Long Island City	498	72.1%	9.4%	5.4%	43.4%	$19,208	20.9%
Dutch Kills	3,368	59.6	5.4	20.0	41.4	$27,667	11.0
Western Sunnyside[5]	0	NA	NA	NA	NA	NA	NA
Long Island City South	2,487	57.8	7.0	20.1	36.4	$25,685	17.4
Total Study Area	**6,353**	**59.9**	**6.4**	**18.9**	**39.6**	**$27,075**	**14.3**
Total Queens	**1,951,598**	**57.9**	**21.7**	**12.2**	**19.5**	**$34,186**	**10.8**
Total NYC	**7,322,564**	**52.3**	**28.8**	**7.0**	**23.7**	**$29,823**	**18.9**
Total LITC	**8,349,010**	**64.5%**	**21.8%**	**6.2%**	**16.3%**	**$36,300**	**13.8%**

Notes:

1 See Figure 4-1.

2 An ethnic group that can include members of all different racial categories.

3 Weighted average.

4 Percent of persons with incomes below the established poverty level; poverty level varies depending on household size.

5 The entire population of the southwestern portion of the study area resides in a state correctional facility.

Source: 1990 *U.S. Census of Population and Housing.*

LONG ISLAND

NEIGHBORHOOD CHARACTER AND COMMUNITY FACILITIES

Long Island, which extends 120 miles from the East River to Montauk Point, includes Kings (or Brooklyn), Queens, Nassau, and Suffolk Counties. Most often, however, the name refers to Nassau and Suffolk Counties and does not include Brooklyn or Queens. The Island includes a wide range of communities. These include suburban towns, remnants of the large estates first developed in the late 1800's and early 1900's, small villages, farmland, and fishing communities.

Much of the Island is suburban in character, occupied by numerous subdivisions developed beginning in the 1950's, such as Levittown. The overall design of these residential communities is automobile-dependent; residents must drive to the store, work, or train. Largely because of the distance from the region's economic core in New York City, Suffolk County contains areas that are less densely developed, particularly on the North and South Forks. In this eastern portion of Suffolk County, farmland remains (potato and duck farms are the Island's most famous agricultural resources), although the 1970's and 1980's saw a trend toward subdivision of agricultural land for second homes and retail uses. Other farmland is now being used for local vineyards and wineries.

Long Island includes some 1,180 miles of coastal shoreline, including land along the Atlantic Ocean, numerous bays, and Long Island Sound. As such, it serves as a major recreational resource to the entire region. Most famous among the Island's beaches are Jones Beach State Park,

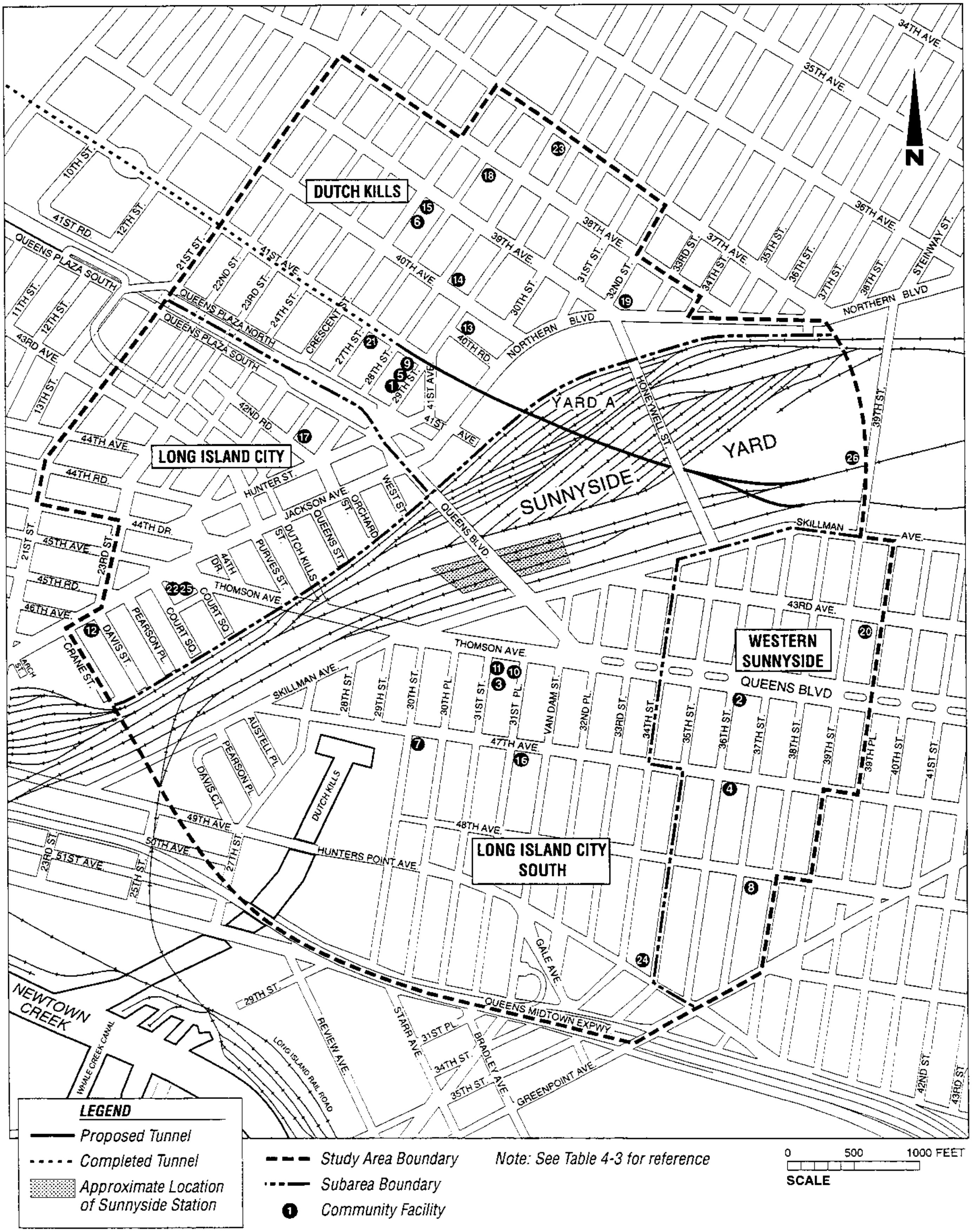

Figure 4-1

Social Conditions: Long Island City/Sunnyside Study Area

Robert Moses State Park, and the beaches of Fire Island and the Hamptons. Other regional attractions include numerous educational institutions, such as SUNY at both Stony Brook and Old Westbury, Long Island University's several campuses, Adelphi University, Hofstra University, and the U.S. Merchant Marine Academy.

Key to the development of the Island's commercial character has been its transportation systems: the LIRR, major roads, and highways. In addition to serving as a major east-west transportation corridor, the LIRR spurred the development of most of the older "downtown" commercial centers on Long Island. These centers, which grew up around LIRR stations, are characterized by small-scale shops and restaurants, often front on the town's main street, and are almost always oriented toward the pedestrian. Good examples include downtowns in Great Neck, Huntington, and Syosset. Newer commercial centers of the strip-mall and superstore variety owe their existence to the Island's highways and major roads, which, in addition to opening up significant areas of the Island to residential development, allowed customers to reach formerly inaccessible areas to shop. These commercial centers are oriented toward the automobile: surrounded by paved parking lots, set back a considerable distance from the street and often accessible only by car. Examples include the Roosevelt Field Mall in Carle Place, the strip malls along Northern Boulevard (25A) and Sunrise Highway, and the outlet malls of Riverhead.

POPULATION AND LABOR FORCE

As shown in Table 4-5, Nassau and Suffolk Counties together include a population of 2.6 million people, some 31.3 percent of the LITC's total population. Largely as a result of its proximity to New York City, Nassau County experienced a development boom immediately after World War II that peaked around 1970. Population then decreased between 1970 and 1990 for a few reasons: families began to have fewer children and manufacturing and defense industry job losses forced residents to move elsewhere in search of work. As shown in the table, the population in Nassau County has declined overall since 1970, by approximately 9 percent. Most of that decrease was between 1970 and 1980, when population decreased by 7.5 percent. Between 1980 and 1990, the decline was only 2.6 percent; since 1990, the population has been growing again.

In contrast, the population of Suffolk County has been increasing steadily over the past decades. Long Island's building boom spread to relatively rural Suffolk County in the 1960's, and population grew at the rate of 69 percent between 1960 and 1970, to 1.1 million residents. During the 1970's, the rate of growth slowed to 14 percent and further decreased to 3 percent between 1980 and 1990 due to some of the same factors that led to lower Nassau County populations. Overall, the population in Suffolk County has grown by 19.7 percent since 1970, and by 1995 its population had eclipsed that of Nassau County by approximately 45,000 people. Consequently, Suffolk County's share of the LITC's population has also grown, from 13.0 percent in 1970 to 16.0 percent today, while Nassau County's share has shrunk slightly, from 16.5 percent to 15.5 percent. In total, population in the two counties has grown by 3.8 percent between 1970 and 1995.

As shown in Table 4-6, population on Long Island is predominately white (88.4 percent), with a small overall percentage of minorities. Long Islanders are also fairly wealthy, particularly in comparison with other residents of the LITC (the median household income for Nassau and Suffolk Counties together is $51,671, compared with $36,300 for the LITC as a whole). Consequently, the percentage of the population living below the poverty level on Long Island is much smaller than in the LITC as a whole (4.2 percent compared with 13.8 percent).

Table 4-5
Long Island Population Trends (in thousands)

Area	1970		1980		1990		1995		Percent Change	
	Number	% of Total LITC	Number	% of Total LITC	Number	% of Total LITC	Number	% of Total LITC	1970-1995	1980-1995
Nassau County	**1,428.1**	**16.5%**	**1,321.6**	**16.0%**	**1,287.3**	**15.4%**	**1,302.3**	**15.5%**	**-8.8%**	**-1.5%**
Hempstead	801.6	9.2	738.5	8.9	725.6	8.7	NA	NA	NA	NA
North Hempstead	235.0	2.7	218.6	2.6	211.4	2.5	NA	NA	NA	NA
Oyster Bay	333.3	3.8	305.8	3.7	292.7	3.5	NA	NA	NA	NA
Glen Cove (City)	25.8	0.3	24.6	0.3	24.1	0.3	NA	NA	NA	NA
Long Beach (City)	33.1	0.4	34.1	0.4	33.5	0.4	NA	NA	NA	NA
Suffolk County	**1,125.0**	**13.0%**	**1,284.2**	**15.6%**	**1,321.9**	**15.8%**	**1,347.1**	**16.0%**	**19.7%**	**4.9%**
Babylon	204.3	2.4	203.5	2.5	202.9	2.4	NA	NA	NA	NA
Brookhaven	245.3	2.8	365.0	4.4	407.8	4.9	NA	NA	NA	NA
East Hampton	11.0	0.1	14.0	0.2	16.1	0.2	NA	NA	NA	NA
Huntington	200.2	2.3	201.5	2.4	191.5	2.3	NA	NA	NA	NA
Islip	278.9	3.2	298.9	3.6	299.6	3.6	NA	NA	NA	NA
Riverhead	18.9	0.2	20.2	0.2	23.0	0.3	NA	NA	NA	NA
Shelter Island	1.6	0.0	2.1	0.0	2.3	0.0	NA	NA	NA	NA
Smithtown	114.7	1.3	116.7	1.4	113.4	1.4	NA	NA	NA	NA
Southhampton	36.2	0.4	43.1	0.5	45.0	0.5	NA	NA	NA	NA
Southold	16.8	0.2	19.2	0.2	19.8	0.2	NA	NA	NA	NA
Nassau and Suffolk	**2,553.0**	**29.4%**	**2,605.8**	**31.6%**	**2,609.2**	**31.3%**	**2,649.4**	**31.5%**	**3.8%**	**1.5%**
Total LITC	**8,680.8**	**100.0%**	**8,256.4**	**100.0%**	**8,349.0**	**100.0%**	**8,405.4**	**100.0%**	**-3.2%**	**1.8%**
New York City	**7,894.8**	**90.9%**	**7,071.6**	**85.7%**	**7,322.6**	**87.7%**	**7,348.6**	**87.4%**	**-6.9%**	**3.9%**

Sources: 1970, 1980, and 1990 figures from *U.S. Census of Population and Housing* and *1998 Long Island Almanac*, 31st edition, published by *Long Island Business News*; NYMTC February 23, 1996 for countywide 1995 figures.

Table 4-6
Long Island 1990 Population Characteristics

Area	Population	Race and Ethnicity				Economic Profile	
		White	Black	Asian	Hispanic[1]	1989 Median Household Income[2]	Below Poverty Level[3]
Nassau County	1,287,348	86.6%	8.6%	3.1%	6.0%	$54,283	3.7%
Suffolk County	1,321,864	90.0%	6.3%	1.7%	6.6%	$49,128	4.6%
Nassau and Suffolk	**2,609,212**	**88.4%**	**7.4%**	**2.4%**	**6.3%**	**$51,671**	**4.2**
Total LITC	**8,349,010**	**64.5%**	**21.8%**	**6.2%**	**16.3%**	**$36,300**	**13.8**

Notes:

[1] An ethnic group that can include members of all different racial categories.

[2] Weighted average.

[3] Percent of persons with incomes below the established poverty level; poverty level varies depending on household size.

Source: 1990 *U.S. Census of Population and Housing.*

In the past 25 years, the LITC's employed labor force has grown 17 percent, by approximately 620,000. Growth on Long Island has far outpaced growth in the boroughs of New York City. Nassau and Suffolk's labor force grew at a rate of 44 percent between 1970 and 1995, compared with 6 percent in that same period in New York City. As shown in Table 4-7, Long Island's labor force has also increased far more quickly than its population in recent decades.

Table 4-7

Total Labor Force Trends (in thousands)

	1970	1980	1990	1995	Percent Change 1970-1990
Nassau	585.5	654.8	690.1	719.1	23
Suffolk	403.2	573.8	698.7	700.0	74
Nassau & Suffolk	**988.7**	**1,228.6**	**1,388.8**	**1,419.1**	**44**
LITC	**3,651.7**	**3,792.4**	**4,277.7**	**4,271.7**	**17%**
New York City	**3,330.8**	**3,161.3**	**3,579.8**	**3,529.5**	**6**

Source: *U.S. Census of Population and Housing* (for 1980 and 1990 figures); NYMTC/Urbanomics, February 23, 1996 (for 1995 figures).

YARD STUDY AREAS

BLISSVILLE YARD

Neighborhood Character and Community Facilities

The Blissville study area lies at the southern reaches of the Long Island City Industrial Park—one of the city's largest industrial parks—which extends north into Long Island City. The section of the study area along Review Avenue is heavily traveled by large trucks that make frequent stops to load and unload cargo. It is a busy area of predominantly storage and warehousing activity. Most of the buildings in the area north of the yard are 2- or 3-story warehouses, while the sites between the yard and Newtown Creek contain a mix of open industrial yards, gasoline storage facilities, and manufacturing facilities. The yard itself is buffered from surrounding public streets by these industrial and warehouse sites, which provide an effective barrier between the yard and local streets. The J.J. Byrne Memorial Bridge, which spans Newtown Creek just south and east of the study area, provides the only direct view into the yard. There are no community facilities in the Blissville Yard study area.

Population Characteristics

The Blissville study area contains no residences and has no permanent population. While there are a limited number of residential buildings mixed among industrial and auto-related uses along 35th Street, Van Dam Street, and Greenpoint Avenue, they all lie outside the study area and are not within a 400-foot radius of the yard boundaries.

MASPETH YARD

Neighborhood Character and Community Facilities

The Maspeth study area is a busy industrial area with many active warehousing, industrial, and auto-related operations that generate substantial truck traffic and high levels of noise. Cars and trucks commonly block sidewalks while loading and unloading, and trucks obstruct traffic. Most of the buildings in the area around the yard are large, low-rise manufacturing structures. The intersection of Maurice and Maspeth Avenues is a small commercial node with a diner/bar and a deli/coffee shop.

As shown in Figure 3-4 in Chapter 3, "Land Use, Zoning, and Public Policy," the eastern portion of the study area includes a small corner of a residential neighborhood that extends east along Maspeth and Grand Avenues. Within the study area, a church (an older structure now occupied by the San Sun Fortress Korean Methodist Church) on a wooded lot backs onto Rust Street across from Maspeth Yard. This area also includes two blocks of small residential rowhouses.

Population Characteristics

The smallest geographical areas for which 1990 census data are available are block groups, generally combinations of several city blocks. In the Maspeth study area, even these block groups are much larger than the small residential area in the corner of the study area (see Figure 4-2). As noted in Table 4-8, the block groups that fall within the Maspeth study area contain a total of 1,500 people. However field surveys indicate the study area includes only an estimated 32 housing units. Consequently, the census data only roughly approximate characteristics of the study area's population. Assuming one household per unit and using the average household size for the study area's two block groups of 2.4 persons per household, the population of the study area is approximately 77. For the census block groups that fall partially within the study area, the median annual household income is $27,489, similar to that of Queens as a whole and lower than that of the LITC. The percent of the population living below the poverty level, 10 percent, is also similar to that of Queens and lower than that of the LITC. The population in the study area is 95 percent white, 4 percent Asian and 9 percent Hispanic (see Table 4-9).

Table 4-8
Yard Study Areas
Community Facilities

Map No.	Name	Address
Blissville Yard		
	None	
Maspeth Yard		
1	San Sun Fortress Korean Methodist Church	57-40 57th Road
Fresh Pond Yard		
1	Mafera Park	25-80 65th Place
2	Christ the King High School	68-02 Metropolitan Avenue
Highbridge Yard		
1	NYPD Bronx Task Force	1278 Sedgewick Avenue
2	P.S. 46	2987 Frederick Douglas Boulevard
3	P.S. 156	2930 Frederick Douglas Boulevard
4	Highbridge Park	NA

Table 4-9
Yard Study Areas—1990 Population Characteristics

		Race and Ethnicity (Percent)				Economic Profile	
Area	**Population**	**White**	**Black**	**Asian**	**Hispanic***	**1989 Median Household Income****	**Below Poverty Level*** Percent**
Blissville Yard	0	NA	NA	NA	NA	NA	NA
Maspeth Yard	1,500	94.7%	0.0%	4.1%	8.9%	$27,489	9.6%
Fresh Pond Yard	16,097	95.9%	0.1%	2.1%	5.9%	$32,170	7.4%
Total Queens	**1,951,598**	**57.9%**	**21.7%**	**12.2%**	**19.0%**	**$34,186**	**10.8%**
Highbridge Yard							
Bronx portion	4,699	8.0%	71.3%	1.9%	34.4%	$12,971	38.9%
Manhattan portion	7,558	7.5%	85.6%	0.1%	16.8%	$15,718	36.0%
Total	12,257	7.7%	80.1%	0.8%	23.6%	$14,665	37.1%
Total Bronx	**1,203,789**	**64.5%**	**21.8%**	**6.2%**	**16.3%**	**$21,944**	**27.8%**
Total Manhattan	**1,487,536**	**58.4%**	**22.0%**	**7.4%**	**25.6%**	**$32,262**	**20.0%**
Total NYC	**7,322,564**	**52.3%**	**28.8%**	**7.0%**	**23.7%**	**$29,823**	**18.9%**
Total LITC	**8,349,010**	**64.5%**	**21.8%**	**6.2%**	**16.3%**	**$36,300**	**13.8%**

Notes:

* An ethnic group that can include members of all different racial categories.

** Weighted average.

*** Percent of persons with incomes below the established poverty level; poverty level varies depending on household size.

Source: 1990 *U.S. Census of Population and Housing*.

FRESH POND YARD

Neighborhood Character and Community Facilities

As shown in Figure 4-3, the Fresh Pond study area is long and irregular in shape. The study area faces four different neighborhoods: Maspeth to the northwest, Middle Village to the northeast, Glendale to the southeast, and Ridgewood to the southwest. As illustrated in Figure 3-5 in Chapter 3, "Land Use, Zoning, and Public Policy," the area immediately around Fresh Pond Yard contains a buffer of industrial uses. Outside of that buffer, the study area is largely residential but also includes a portion of a large cemetery. The Maspeth portion of the Fresh Pond Yard study area lies off Metropolitan Avenue, a busy arterial lined by cemeteries and retail, including the Metro Mall at Metropolitan Avenue and Rentar Plaza. West of the Metro Mall, a small residential area along Admiral Avenue abuts the railroad tracks of Fresh Pond Yard. East of the Metro Mall and on the other side of the railroad tracks leading to the yard, the Middle Village section of the study area is fully occupied by a small portion of the Mt. Olivet Lutheran Cemetery. Near the cemetery, Christ the King High School is just outside the study area (see Figure 4-3, No. 2).

Southeast of Fresh Pond Yard, the Glendale section of the study area consists primarily of low-rise residences on quiet tree-lined streets that dead end at the Fresh Pond Yard or the few adjoining industrial and warehouse sites. Southwest of the yard, the Ridgewood section of the study area is more densely developed than other portions of the study area. It consists predominantly of attached houses and apartments. Shaler Avenue, Mafera Park, and Traffic Avenue, lined with industrial and warehouse buildings, buffer the residential area from the rail line. In this portion of the study area, the 5.4-acre Mafera Park (on the east side of 65th Place—No. 1 in Figure 4-3) abuts the railroad tracks. The park, which was renovated in 1995, includes a roller rink with bleachers, baseball, basketball, and handball courts, softball and football fields, and play equipment. A softball field is in the area closest to Fresh Pond Yard. The central portion of the yard is not visible from the park.

Population Characteristics

The census block groups that fall wholly or partially within the Fresh Pond study area include a total of 16,097 residents (see Figure 4-3 and Table 4-9). The median household income is $32,170, slightly lower than for Queens as a whole or for the entire LITC, but the percent below poverty level, at 7 percent, is smaller than that in Queens or the LITC. The population is 96 percent white, 2 percent Asian, and 6 percent Hispanic.

HIGHBRIDGE YARD

Neighborhood Character and Community Facilities

The Highbridge study area is bisected by the Harlem River (see Figure 4-4). The Highbridge Yard is located on the eastern side of the river, in the Bronx. The yard is inactive as a rail car storage yard and is partially overgrown, although it includes some tracks. The Oak Point Link freight line and Metro-North Railroad's Hudson Line mainline tracks pass through this area west of the Major Deegan Expressway. The abandoned Putnam Division railroad right-of-way just east of Highbridge Yard is proposed as a possible bicycle/pedestrian Greenway trail extending as far south as Macomb's Dam Bridge in the *New York City Greenway Plan* published by the New York City Department of City Planning.

The Bronx side of the study area is dominated by the Major Deegan Expressway, which acts as a physical and visual barrier between the rail yard and the neighborhood to its east. The Major Deegan (I-87) is a wide and heavily trafficked, limited access interstate highway that is elevated as it enters the study area from the south. It then descends to grade level as it passes the yard. The yard is accessible only from Depot Place, which crosses the Major Deegan Expressway from Sedgwick Avenue. Two other major infrastructure elements also dominate the study area: the Macombs Dam Bridge at the south end of the study area, and High Bridge at the north. Both of these bridges are historic resources. The Macombs Dam Bridge carries traffic between West 155th Street in Manhattan to West 161st Street and Jerome Avenue in the Bronx. In Manhattan, 155th Street meets the bridge on a historic viaduct that runs above the regular street grade from Edgecombe Avenue to the bridge. High Bridge once carried water in an aqueduct across the river from the Bronx to Manhattan and was subsequently a pedestrian bridge, but is now closed.

As described in Chapter 3, "Land Use, Zoning, and Public Policy" (see also Figure 3-6 in that chapter), the neighborhood east of the Major Deegan Expressway in the Bronx is largely residential. This area is significantly higher in elevation than the Highbridge Yard. Residential uses include the high-rise High Bridge Houses complex, located on University Avenue on a steep hill overlooking the Major Deegan Expressway and the Harlem River. This "superblock" complex includes six 13-story buildings to the north and two 6-story buildings to the south, where stairs provide pedestrian access between University Avenue at the top of the hill and Sedgwick Avenue below. The study area also includes some smaller apartment buildings and rowhouses north of West 167th Street. Pedestrian and auto traffic is light, but ambient noise

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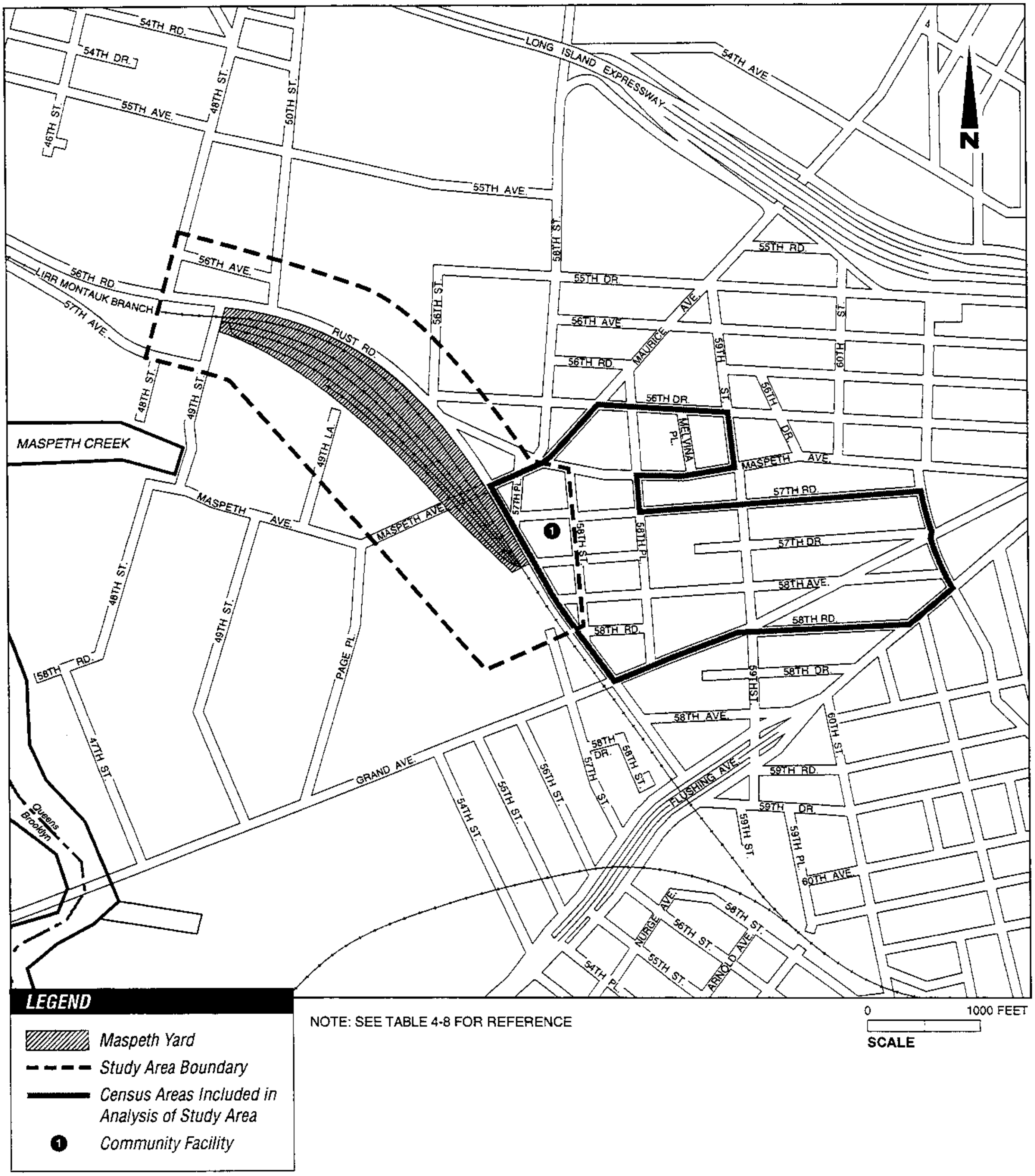

NOTE: SEE TABLE 4-8 FOR REFERENCE

Figure 4-2

Social Conditions: Maspeth Yard Study Area

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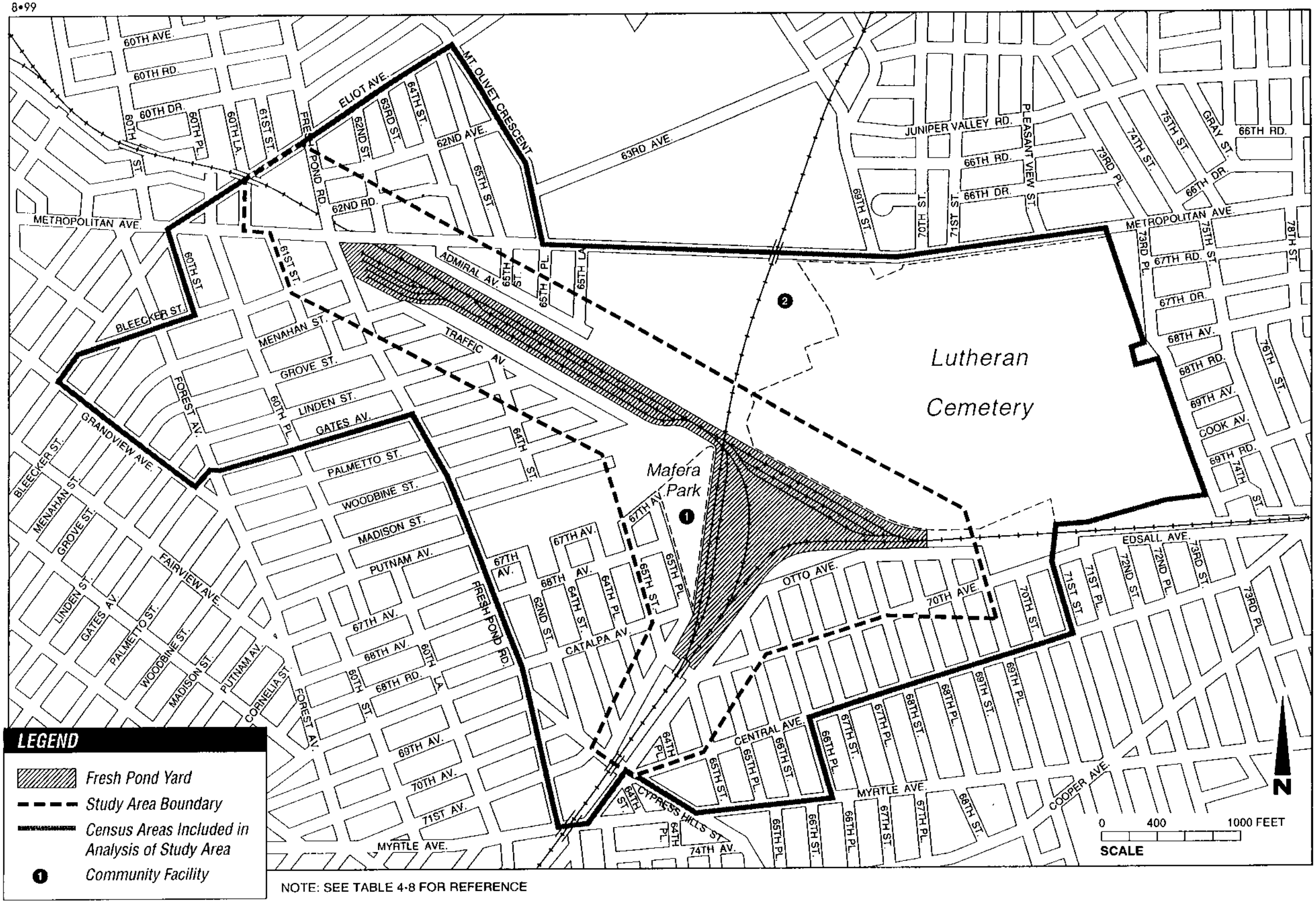

NOTE: SEE TABLE 4-8 FOR REFERENCE

MTA / LIRR

East Side Access

Figure 4-3

Social Conditions: Fresh Pond Yard Study Area

from the expressway is loud. The New York City Police Department Bronx Task Force is located at 1278 Sedgwick Avenue between 167th Avenue and Depot Place. Sedgwick Avenue is also designated as a bicycle route on New York City's Citywide Cycling Map.

The Manhattan portion of the study area is dominated by the Harlem River Drive, a limited access parkway with a riverfront bicycle and pedestrian path running along the western shore of the Harlem River, and the southern half of the 119-acre Highbridge Park. Highbridge Park slopes steeply uphill from the Harlem River Drive to its western boundary at Edgecombe and Amsterdam Avenues. The eastern portion of the park is a steep wooded hill that is not accessible to the public. At the top of the hill, the park includes a grassy area and a scenic overlook with views of the river and the Highbridge Yard partially obstructed by trees.

South of Highbridge Park, the Manhattan portion of the study area includes two housing complexes on a large triangular plot: the eight 14-story buildings of Colonial Park Houses to the north and the four 30-story buildings of Polo Grounds Houses to the south. These complexes front onto Frederick Douglass Boulevard; their western boundary is the Harlem River Driveway (an access road to the Harlem River Drive); and their southern boundary is the elevated 155th Street viaduct. Colonial Park Houses also includes a school, P.S. 46, on the east side of Frederick Douglass Boulevard near the Harlem River Drive. Across Frederick Douglass Boulevard from these two residential complexes is another school, P.S. 156 (the Eugene Percy Roberts School) and its 3-acre playground, both located alongside the Harlem River Drive.

Population Characteristics

As shown in Table 4-9, the Highbridge study area include a total of 12,257 residents—4,699 (38 percent) in the Bronx, and 7,558 (62 percent) in Manhattan. Overall, these tracts consist predominantly of minorities and low-income households. Only 8 percent of the population in these tracts is white (compared with 36 percent for the Bronx, 58 percent for Manhattan, and 65 percent for the LITC). As shown in the table, most of the study area residents are black and many are Hispanic. The median annual household income in the area is relatively low at $14,665 ($12,971 in the Bronx portion and $15,718 in Manhattan), substantially less than the median household incomes for either the Bronx, Manhattan, or the LITC (see Table 4-9). Similarly, the percentage of residents living below the poverty level, 37.1 percent, is much higher than in either the Bronx (27.8 percent), Manhattan (20 percent), New York City as a whole (18.9 percent) or the LITC (13.5 percent).

C. FUTURE CONDITIONS COMMON TO ALL ALTERNATIVES

LONG ISLAND TRANSPORTATION CORRIDOR OVERVIEW

Given the generally highly developed character of the LITC, future (2010 and 2020) conditions are not likely to see broad changes. The character of the region will still show similar relationships: Manhattan will continue as the dense commercial hub, with major cultural and other institutional attractions; Queens and Brooklyn will remain strong population centers, with growing business districts in Downtown Brooklyn and Long Island City and a diminished industrial character; and Nassau and Suffolk Counties will continue to have a varied suburban character while western Suffolk will become increasingly suburbanized. The attractions of the region's community facilities and institutions will remain high.

NYMTC projections show a population increase for the LITC of 4.7 percent from 1995 to 2010, and 10.3 percent from 1995 to 2020, as shown in Table 4-10. More telling for the issue of travel, however, is the predicted increase in trip-based, employed labor force: as shown in Table 4-11, those who will have jobs and travel to work will increase 11.2 percent from 1995 to 2010 and 16.1 percent from 1995 to 2020. Demand for travel from Long Island to Manhattan is predicted to increase at an even higher rate. As shown on Tables 4-11, 4-12, and 4-13, Long Island residents commuting to Manhattan will increase from 129,446 in 1995 to 159,183 in 2010 and 167,959 in 2020; this represents an increase of 23 percent in the first period and 30 percent overall. Together, these figures indicate that, while the automobile-dependent character of Nassau and Suffolk Counties is unlikely to wane, reliance on the LIRR as a means of transportation is likely to increase.

Table 4-10

LITC Population 1995, 2010, 2020 (in thousands)

				Percent Change		
	1995	**2010**	**2020**	**1995 to 2010**	**2010 to 2020**	**1995 to 2020**
Nassau	1,302.3	1,349.8	1,433.6	3.6%	6.2%	10.1%
Suffolk	1,347.1	1,495.2	1,658.1	11.0%	10.9%	23.1%
Nassau & Suffolk	**2,649.4**	**2,845.0**	**3,091.7**	**7.4%**	**8.7%**	**16.7%**
Manhattan	1,510.0	1,556.7	1,575.0	3.1%	1.2%	4.3%
Queens	1,970.3	2,062.4	2,189.2	4.7%	6.1%	11.1%
Brooklyn	2,275.7	2,333.7	2,412.4	2.5%	3.4%	6.0%
LITC	**8,405.4**	**8,797.8**	**9,268.3**	**4.7%**	**5.3%**	**10.3%**

Source: NYMTC/Urbanomics February 23, 1996.

Table 4-11

LITC Employed Labor Force 1995, 2010, 2020 (in thousands)

				Percent Change		
	1995	**2010**	**2020**	**1995 to 2010**	**2010 to 2020**	**1995 to 2020**
Nassau	643.7	720.4	769.6	11.9%	6.8%	19.6%
Suffolk	624.8	760.2	894.6	21.7%	17.7%	43.2%
Nassau & Suffolk	**1,268.5**	**1,480.6**	**1,664.2**	**16.7%**	**12.4%**	**31.2%**
Manhattan	675.2	729.9	743.0	8.1%	1.8%	10.0%
Queens	866.6	958.9	1,030.9	10.7%	7.5%	19.0%
Brooklyn	835.7	913.0	973.0	9.2%	6.6%	16.4%
LITC	**3,646.0**	**4,082.4**	**4,411.1**	**12.0%**	**8.1%**	**21.0%**

Note: Figures are for trip-based, employed labor force, and do not include those who work at home.

Source: Journey-to-Work Forecasting and Analysis, Urbanomics/NYMTC, September 27, 1995 as used in MTA Long Range Planning Framework Projects: MESA, ARC, LIRR/ESA.

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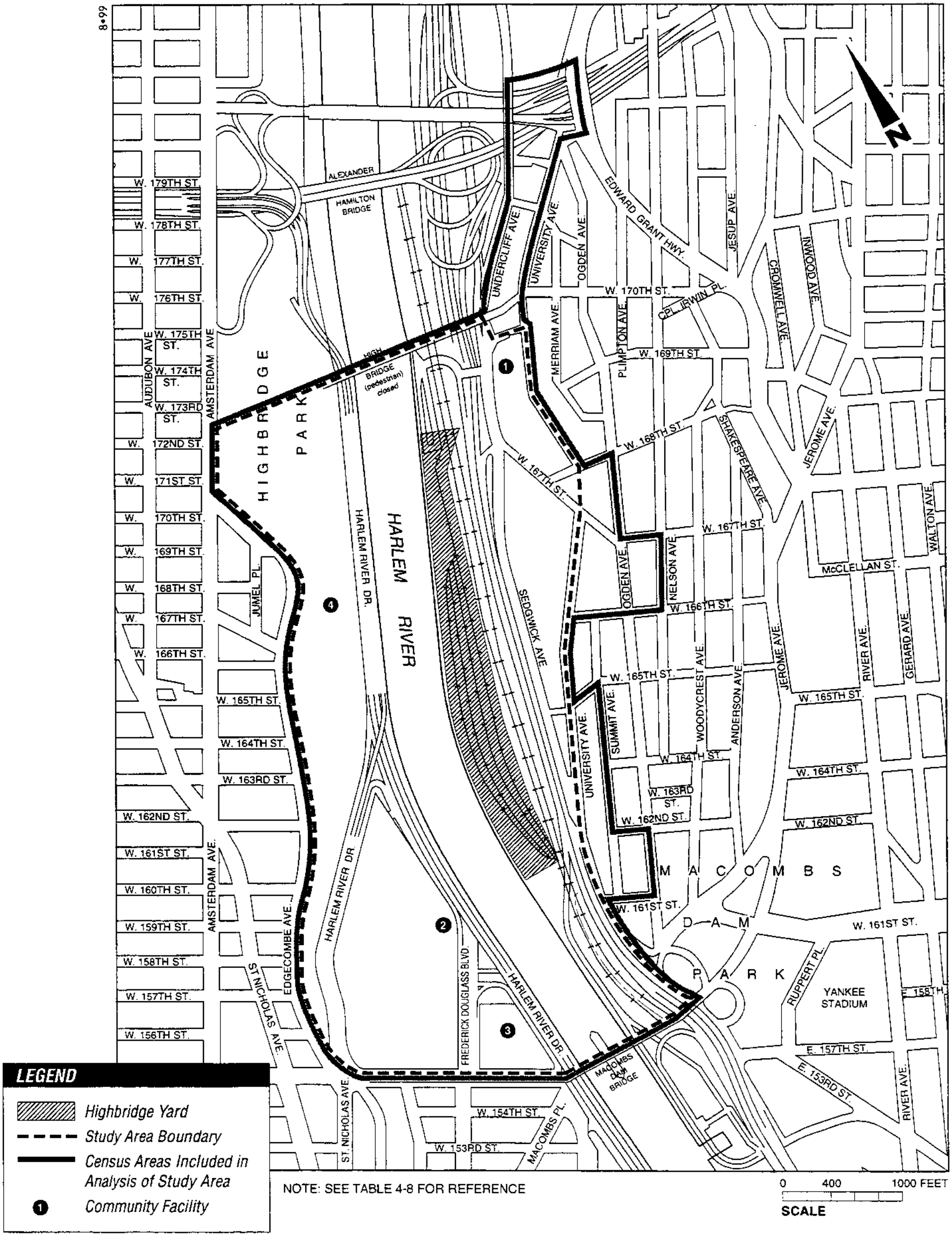

NOTE: SEE TABLE 4-8 FOR REFERENCE

Figure 4-4

Social Conditions: Highbridge Yard Study Area

Table 4-12
LITC 2010 Labor Force by Employment Location

Location of Residence	Total Trip-Based Employed Labor Force	Location of Employment					
		Manhattan		Other NYC		Long Island	
		Workers	Percent of Manhattan's Work Force	Workers	Percent of NYC's Work Force	Workers	Percent of LI's Work Force
Nassau County	72,039	112,706	5.2%	117,637	6.8%	474,684	38.1%
Suffolk County	760,217	46,625	2.1	46,690	2.7	657,402	52.8
Nassau & Suffolk	**1,480,596**	**159,331**	**7.3%**	**164,327**	**9.4%**	**1,132,086**	**91.0%**
Manhattan	729,870	611,464	28.0	73,863	4.2	7,921	0.6
Queens	958,919	366,818	16.8	490,368	28.2	68,886	5.5
Brooklyn	913,004	350,198	16.0	523,626	30.1	12,226	1.0
LITC	**4,082,389**	**1,487,811**	**68.1%**	**1,252,184**	**72.0%**	**122,119**	**98.1%**
Total Work Force		**2,185,093**	**100.0%**	**1,739,212**	**100.0%**	**1,244,726**	**100.0%**

Note: This table presents employed trip-based labor force and trip-based work force which do not include those who work at home. Employed labor force consists residential population that works (outside the home); work force consists of employees, at their workplace.

Source: Journey-to-Work Forecasting and Analysis, Urbanomics/NYMTC, September 27, 1995 as used in MTA Long Range Planning Framework Projects: MESA, ARC, LIRR/ESA.

Table 4-13
LITC 2020 Labor Force by Employment Location

Location of Residence	Total Trip-Based Employed Labor Force	Location of Employment					
		Manhattan		Other NYC		Long Island	
		Workers	Percent of Manhattan's Work Force	Workers	Percent of NYC's Work Force	Workers	Percent of LI's Work Force
Nassau County	769,611	117,198	5.2%	129,093	6.8%	506,847	36.0%
Suffolk County	894,635	51,011	2.3	53,677	2.8	779,202	55.4
Nassau & Suffolk	**1,664,246**	**168,200**	**7.4%**	**182,779**	**9.6%**	**1,286,048**	**91.5%**
Manhattan	743,003	617,751	27.3	78,496	4.1	8,286	0.6
Queens	1,030,857	380,610	16.8	541,135	28.4	73,585	5.2
Brooklyn	973,004	363,338	16.1	567,018	29.7	13,215	0.9
LITC	**4,411,110**	**1,529,899**	**67.6%**	**1,369,428**	**71.8%**	**1,381,134**	**98.2%**
Total Work Force		**2,261,857**	**100.0%**	**1,906,766**	**100.0%**	**1,406,188**	**100.0%**

Note: This table presents employed trip-based labor force and trip-based work force which do not include those who work at home. Employed labor force consists residential population that works (outside the home); work force consists of employees, at their workplace.

Source: Journey-to-Work Forecasting and Analysis, Urbanomics/NYMTC, September 27, 1995 as used in MTA Long Range Planning Framework Projects: MESA, ARC, LIRR/ESA.

Proposed actions to improve transportation service in the LITC that could reasonably be in place by 2010 and 2020 are described in detail in Chapter 1, "Project Purpose and Need," and Chapter 9, "Transportation." Several of these, such as the light rail system between John F. Kennedy Airport and Jamaica Station, and new equipment on the LIRR that would permit riders on diesel lines to get to Penn Station without a transfer, will offer new or more convenient service. However, none of these proposals would improve the LIRR to the point where it could offer service and capacity increases needed to accommodate the rapidly increasing numbers of commuters to and from Manhattan, who make up the vast majority of LIRR patrons, or to improve conditions for those seeking other destinations served by the railroad (e.g., museums, arenas, stadiums, parks, beaches, theaters, hospitals, courts, etc.).

MANHATTAN STUDY AREA

NEIGHBORHOOD CHARACTER AND COMMUNITY FACILITIES

The character of the Manhattan study area is well established as a densely developed Central Business District (CBD), surrounded by substantial and varied residential neighborhoods. Recent trends toward changing neighborhood character through the turnover of manufacturing and loft buildings to office, retail, or residential space, can be expected to continue in portions of the Lower East Side, NoHo, the section of Soho west of Sixth Avenue, known as the Graphic Arts district, the Gansevoort Meat Market, West Chelsea, West Midtown/Garment Center, and West Clinton. The trend, bolstered by public policy and public actions, toward strengthening and upgrading West Midtown/Times Square and the Theater District is also expected to continue. Projects such as the ongoing 42nd Street Development Project and other new development proposed in that area will serve to intensify its character as the region's (perhaps the nation's) premier entertainment district and to increase its presence as a first class office district. Several of the proposals and trends in the area around Penn Station will likely improve the CBD character of this portion of West Midtown, as well. These include the new Amtrak station in the General Post Office (Farley) Building, development of the site on Ninth Avenue west of the Farley Building, and the influence of the 42nd Street Development Project, coupled with ongoing real estate trends in the blocks south of 42nd Street between Sixth and Eighth Avenues, to replace manufacturing and wholesaling with office and residential uses.

The neighborhood surrounding GCT in East Midtown is likely to retain the same general character over time. Park Avenue, with its elegant landscaped median, will continue to be the most desirable location in the CBD; on Madison Avenue, the Bear Stearns building at 46th Street (383 Madison), now under construction, and the proposed office tower just south of 42nd Street (known as 310 Madison Avenue) will solidify the area's character as an extremely dense office district. South of GCT in the Midtown South and Union Square areas, the current trends toward upgrading of office uses and new construction (where sites can be found) of residential buildings will continue, underscoring the mixed-use, slightly less dense character of this commercial neighborhood.

The trend toward a 24-hour community in Lower Manhattan, discussed in Chapter 3, "Land Use, Zoning, and Public Policy," is particularly marked, and is expected to continue into the future. The expansion of the New York Stock Exchange in generally the same location as the existing Exchange building will maintain Wall Street's character as the hub of the financial district. The completion of Battery Park City and the conversion of older office and loft buildings to residential use will strongly influence the area's neighborhood character in the future, as one of a dense mix of uses in a 24-hour working and living community.

The regional community resources in the Manhattan study area will maintain their role in serving the metropolitan area and tourists in the future. Several planned moves or expansions, such as the expansion of the Museum of Modern Art on West 53rd Street and the consolidation of the City University Graduate Center in the old B. Altman's building on 34th Street and Fifth Avenue, will help to strengthen these facilities in meeting the needs of their constituencies.

POPULATION AND LABOR FORCE

Predictions for increases in population in the Manhattan study area show a relatively stable situation overall, with an increase of 3.1 percent from 1995 to 2010 and another 1.2 percent from 2010 to 2020 (see Table 4-14). Specific neighborhoods, however, will see greater increases. These include: Lower Manhattan, reflecting the completion of Battery Park City and the trend to residential conversion; Garment Center, reflecting new residential construction slated for Sixth Avenue between 23rd and 31st Streets; Midtown, where residential development along Eighth Avenue is expected; and Lincoln Square, which anticipates completion of Riverside South and other large projects with residential components.

Table 4-14

Manhattan Population Trends: 1995, 2010, and 2020

				Percent Change		
	1995	**2010**	**2020**	**1995-2010**	**2010-2020**	**Total 1995-2020**
Lower Manhattan	47,487	56,925	59,148	19.9%	3.9%	24.6%
Village/Lower East Side	235,814	239,418	240,267	1.5%	0.4%	1.9%
Chelsea	25,551	25,626	25,686	0.3%	0.2%	0.5%
Clinton	38,176	39,154	41,990	2.6%	7.2%	10.0%
Garment Center	5,980	8,832	9,503	47.7%	7.6%	58.9%
Lower Fifth	27,592	29,474	31,231	6.8%	6.0%	13.2%
Midtown	14,690	15,607	17,556	6.2%	12.5%	19.5%
Midtown South	87,819	89,593	90,010	2.0%	0.5%	2.5%
Midtown East	64,720	65,584	66,524	1.3%	1.4%	2.8%
Lincoln Square	29,600	35,080	36,864	18.5%	5.1%	24.5%
Upper East Side	70,383	71,809	72,527	2.0%	1.0%	3.0%
Manhattan Study Area	**647,812**	**677,102**	**693,326**	**4.5%**	**2.4%**	**7.0%**
Other Manhattan	862,184	879,590	883,689	2.0%	0.5%	2.5%
Total Manhattan	**1,509,996**	**1,556,692**	**1,577,015**	**3.1%**	**1.3%**	**4.4%**

Source: NYMTC February 23, 1996.

As shown in Table 4-11, above, the labor force in Manhattan will increase by more than 8 percent between 1995 and 2010. This predicted labor force increase is more than double the predicted population increase and reflects an increase in multiple-worker households and families. These additional workers will, for the most part, work in Manhattan—according to NYMTC's projections, the increase in reverse commuters from Manhattan to Long Island will be small and Manhattan residents will still represent a very small portion (less than 1 percent) of the Long Island work force (see Table 4-13). From 2010 to 2020, the imbalance between population growth (1.2 percent) and labor force growth (1.8 percent) will be less pronounced, as the growth in both areas will slow considerably.

LONG ISLAND CITY/SUNNYSIDE STUDY AREA

NEIGHBORHOOD CHARACTER AND COMMUNITY FACILITIES

In the future, the character of the Long Island City/Sunnyside study area should continue to evolve. As noted above, a trend toward more and upgraded office use has taken hold in "downtown" Long Island City. This movement will be accelerated if the proposed Long Island City rezoning is approved (see Chapter 3, "Land Use, Zoning, and Public Policy"). Four to five office towers, similar to, but not as large as the Citicorp tower would be built in the area of Jackson Avenue on the south side of Queens Plaza and at Court Square. A small amount of residential infill and new buildings are expected, as well. These changes would be enough to clearly alter the visual character of the area and, with anticipated office and retail upgrading, introduction of new, larger institutional uses and perhaps a department store, the rezoning would transform the character of Long Island City. It would be more like a CBD—development would be denser and the types of commercial uses would more closely resemble those in downtown Brooklyn.

The recent acquisition of P.S. 1 by the Museum of Modern Art and the proposed expansion of LaGuardia Community College across Sunnyside Yard from "downtown" Long Island City signal the continuing strength of the area's cultural and educational institutional base.

POPULATION

The study area should see modest increases in population as a result of the Long Island City rezoning, which is predicted to result in approximately 300 new housing units, for an estimated 750 new residents. Nearby, just outside the study area, the Hunters Point Mixed Use district should see some increase in housing resulting from a recent rezoning permitting such development.

LONG ISLAND

NEIGHBORHOOD CHARACTER AND COMMUNITY FACILITIES

The estimates of the future of Nassau and Suffolk Counties show some similarities and some differences. Both counties contain large, previously industrial sites that are likely to be developed with a mix of other uses by 2010 and 2020. These include the Lockheed Martin site in Lake Success (for which a mixed-use commercial development is proposed), the Grumman Bethpage site (slated for office, institutional, and distribution uses), the Nassau Hub (the County proposes a mixed commercial and entertainment development near the existing Nassau Coliseum), the Cerro Wire site in Oyster Bay (an upscale fashion mall is proposed), and Calverton in Riverhead (proposed for modern industrial use). These will continue a trend to replace industrial centers with other commercial and job-producing uses. The trend toward continued residential construction where land is available is expected to continue throughout the area. This trend will, however, be stronger in western Suffolk County, which is less developed than Nassau County and still a reasonable commuting distance from employment centers on the Island and in Manhattan. These trends will maintain the character of both counties as a distinct metropolitan area, with suburban development and strong employment centers.

The character of eastern Suffolk County, which is rural, agricultural, and influenced by the area's strong recreational attraction, will be maintained to some extent through public policy, which is focused on preserving farmland and maintaining environmental quality in the area, and also on the marketplace, which has found both the North and South Fork farmland to be attractive for the wine-making industry. Most recently, national and international wineries have begun to invest in existing Long Island wineries and to plan expansions through the purchase of other types of farmland and vacant land. However, the pressure for second homes is expected to continue as are increases in the types of retail uses associated with a recreational area (e.g., Tanger Factory Outlet Centers) plus the retail uses associated with increases in population throughout Suffolk County (e.g., the proposed major shopping center at the intersection of William Floyd Parkway and the Sunrise Highway).

Long Island's role as a provider of substantial community resources will remain in the future, as well. The beaches along both shores will continue to serve local and county residents, the entire metropolitan area, and visitors from throughout the world. And all of Long Island's major community resources that are served by the LIRR will continue as off-peak trip generators.

POPULATION AND LABOR FORCE

As shown in Table 4-10, above, the population of Long Island is expected to increase by 7.4 percent from 1995 to 2010 and by another 8.7 percent from 2010 to 2020. Not surprisingly, since it is relatively less developed now, Suffolk County will outpace Nassau in population growth for both periods. This will be accompanied by strong increases in the trip-based, employed labor force in both counties, with Suffolk County leading the way. As shown in Table 4-11, the labor force on Long Island will increase drastically in the future: by 16.7 percent from 1995 to 2010 and by another 12.4 percent from 2010 to 2020. Suffolk County increases will be the higher and more dramatic—21.7 and 17.7 percent for the two time periods, respectively. With the strong increase in population and trip-based labor force, the number of Long Island residents who commute into New York City will rise as well (by 15.5 percent from 1995 to 2010 and by another 8.4 percent from 1995 to 2020).

YARDS

The neighborhood character of the yard study areas in unlikely to evolve or change much in the future. Additionally, each of the yard study areas is largely developed and there is unlikely to be much growth in either population or labor force in the Blissville, Maspeth, Fresh Pond, or Highbridge study areas. However, as noted in Chapter 3, "Land Use, Zoning, and Public Policy," the city has a proposed to create a public access easement just east of Highbridge Yard for a Greenway bicycle/pedestrian path extending as far south as Macomb's Dam Bridge.

D. PROBABLE IMPACTS OF PROJECT ALTERNATIVES

NO ACTION ALTERNATIVE

In general, the No Action Alternative would result in adverse effects on social conditions throughout the LITC. Without improvements to the transportation system, access to the region's community facilities, workplaces, homes, and areas of commerce would become more difficult and less convenient. As described earlier, population and labor force are projected to grow; ridership on the LIRR is also predicted to increase. The increasing demand for transportation service would result in growing conflicts as the system reaches or even exceeds its capacity (see Chapter 1, "Project Purpose and Need"). On Long Island, where use of the LIRR is strongest, the decrease in quality of LIRR service would be felt most strongly. This change would inconvenience all study area residents and support the trend toward an area characterized by increased dependence on the automobile. A portion of the labor force living on Long Island would be more likely to seek jobs outside the region's commercial center—New York City. Furthermore, the railroad's influence on land use trends would weaken, resulting in a stronger trend toward sprawling development and auto-dependent land use patterns. This is likely to have an adverse impact on efforts to preserve community character in areas dependent on the LIRR.

Within the Manhattan study area, the east-west movement of commuters between Penn Station and East Midtown would increase, intensifying the crowding and congestion on Midtown's side streets. This would adversely affect community character. There would be no improvement in access to employment centers or to the area's many important regional community facilities and services.

The Long Island City/Sunnyside study area would not benefit from a new station in Sunnyside Yard. The Long Island City/Sunnyside study area would be relatively unaffected by deterioration in LIRR service, since without the new station very few of its residents or workers would be riding the LIRR.

The No Action Alternative would have no effect on social conditions in any of the yard study areas.

TRANSPORTATION SYSTEMS MANAGEMENT (TSM) ALTERNATIVE

The TSM Alternative would slightly improve transportation service to East Midtown Manhattan, and therefore would result in small decreases in congestion in Midtown. Overall, however, the TSM Alternative would have little effect in terms of strengthening the CBD or improving access to regional community facilities. Overall, the TSM Alternative would not improve neighborhood character in Midtown.

By providing additional service to the LIRR Hunterspoint Avenue station, the TSM Alternative might somewhat strengthen the emerging CBD in Long Island City and improve access to the Long Island City/Sunnyside area. While it would not provide improved transportation access to the population in the Long Island City/Sunnyside study area or improve neighborhood character there (because it would not build new Sunnyside station), it would improve access from Long Island to the area just west of the Long Island City/Sunnyside study area.

By offering some increase in capacity for commuter service on the LIRR, the TSM Alternative would cause less inconvenience to residents of Long Island than the No Action Alternative, but it would not abate the trend toward a neighborhood character more strongly characterized by dependence on the automobile.

The TSM Alternative would not result in any changes at the yard study areas.

PREFERRED ALTERNATIVE

The discussion below focuses on the effects of the Preferred Alternative once operational. Potential short-term effects of construction on neighborhood character, community facilities, and residential population in the LITC and study areas are discussed in Chapter 17, "Construction and Construction Impacts."

LONG ISLAND TRANSPORTATION CORRIDOR

Overall, by improving access to the region's CBD, the Preferred Alternative would support and enhance existing social conditions in the LITC. The LIRR is a key transportation element throughout the LITC. By greatly improving service to Manhattan from eastern Queens and Long

Island, and by adding origin/destination options (GCT and Sunnyside station), the Preferred Alternative would benefit all corridor residents and would improve access to the region's community facilities. Those residents of Long Island and eastern Queens, who would use the LIRR for their daily commute, would experience the greatest benefit. However, since the LIRR serves the region's community facilities, all residents would benefit. In addition, because the Preferred Alternative would succeed in diverting to the LIRR some commuters who would otherwise drive to work, it would support transit-centered development and help to shift the trends that currently favor suburban sprawl and automobile dependence.

MANHATTAN STUDY AREA

Within the Manhattan study area, the Preferred Alternative would greatly improve access for LIRR commuters to East Midtown. This would support the character and development patterns of the Midtown CBD, which shows a strong trend to increased attractiveness and commercial development between 42nd and 59th Streets, from Seventh to Third Avenue—an area within walking distance of GCT. By restructuring the Manhattan trip patterns of LIRR commuters (i.e., removing the need for many commuters to travel east to their ultimate destinations), the Preferred Alternative would also reduce east-west pedestrian, subway/bus, and vehicular travel in Midtown. Although LIRR commuter movements are only a small percentage of overall activity in the area, this reduction would nonetheless be beneficial to neighborhood character in Midtown.

As discussed in Chapter 6, "Visual and Aesthetic Considerations," the new street entrances/exits would be visible and consistent in character with the busy East Midtown area north of GCT. The new entrances/exits would add pedestrians to the immediately surrounding sidewalks, changing these very localized conditions. The effect of these additional pedestrians would dissipate quickly, since these commuters would be coming to the East Midtown area in any case, and therefore would not be new to the area as a whole but only to the particular entrance/exit that they chose to use. A proposed new entrance at 280 Park Avenue under both Options 1 and 2 of the Preferred Alternative would affect a plaza area occupied by planters that serves as an open space resource, as well as a plaza space with planters at 270 Park Avenue that generally does not. Overall, these effects would not be considered significant, as plaza space would remain available for use at both locations.

In addition, by providing greatly improved access for LIRR passengers to East Midtown and destinations on the Upper East Side as well, the Preferred Alternative would increase the accessibility of several major regional community facilities (such as the Museum of Modern Art, the Frick Collection, the Metropolitan Museum of Art, the Pierpont Morgan Library, the New York Public Library, the East Side medical centers), the Theater District, East Midtown shopping areas, and a number of other tourist and entertainment attractions.

LONG ISLAND CITY/SUNNYSIDE STUDY AREA

Introduction of the new Sunnyside station under the Preferred Alternative would benefit the Long Island City/Sunnyside study area. The new station would add rail access to the study area, and thus support the anticipated new CBD in Long Island City, the industrial area of Long Island City/Sunnyside, and the public, cultural, and education institutions in the area (e.g., Court House, LaGuardia Community College, P.S. 1/MoMA). The new station would benefit some residents of the Long Island City/Sunnyside study area by providing them with improved access to the LIRR.

On a more local level, the new station would be attractive in design and visible from neighborhoods on both sides of Sunnyside Yard. This, and the increased pedestrian activity across the Queens Boulevard bridge that the station would engender, would help to better link the two neighborhoods both visually and through practical use.

LONG ISLAND

The Preferred Alternative would greatly improve LIRR service to Long Island residents, both by adding capacity and by providing direct access to East Midtown. This increased mobility would benefit Long Island's population. Commuters and visitors would benefit from reduced travel times, more efficient connections, increased capacity, and reduced crowding. These improvements would draw new customers to the LIRR from their cars, so that the Preferred Alternative would reduce traffic on the area's regional highway system and reduce vehicle miles traveled (see Chapter 9, "Transportation"). This would have a beneficial effect on the area's generally auto-dependent character. As described in Chapter 3, "Land Use, Zoning, and Public Policy," the project would also support the development of transit-oriented land use patterns on Long Island, further assisting in curtailing sprawl. Furthermore, more convenient commutes, reduced travel time, and less traffic congestion on Long Island would improve the quality of life for many Long Island residents.

The noise and traffic impacts identified in Chapters 11, "Noise and Vibration," and 9, "Transportation," would not have significant impacts on neighborhood character. Although increases in noise constitute a noise impact under FTA guidelines, these adverse effects would occur in areas that are already subject to train noise. Thus, no new factor to alter neighborhood character would be introduced. Traffic impacts would all be mitigated with standard improvement measures. The impacts identified were along major station access routes, and the changes would not be enough to alter the characters of an area already subject to moderate-to-high peak hour traffic.

YARDS STUDY AREAS

The Preferred Alternative would intensify the use of the freight yards analyzed in this chapter—Blissville, Maspeth, Fresh Pond, and Highbridge Yards.

Blissville Yard

The new freight activity in Blissville Yard associated with the Preferred Alternative would not result in changes to the character of the area surrounding the yard. The area is strongly industrial and would remain as such. There are no residences in the yard study area, and no residences outside the study area that are not separated from the rail yard by a buffer of industrial uses. The Preferred Alternative would not have adverse impacts on the character of the Blissville study area.

Maspeth Yard

The increase in rail freight activity associated with the Preferred Alternative would not result in changes to the character of the surrounding area. The Maspeth Yard study area is predominantly industrial, and the new rail activity would be consistent with that character. The small residential area in the eastern part of the study area would also not be adversely affected by the increase in rail activity, as it already coexists with rail activity. The changes to the yard similarly would not affect the church in that residential neighborhood, which faces away from the yard. Without adverse impacts on neighborhood character, the Preferred Alternative would not have adverse effects on the population in the yard study area, either.

Fresh Pond Yard

The new freight facility in the East Yard at Fresh Pond (see Chapter 3, "Land Use, Zoning, and Public Policy"), together with the increase in rail freight activity at the yard, would not adversely affect the character of the surrounding neighborhood. As described earlier, the surrounding residential neighborhood is buffered from the yard by a wall of industrial buildings and, therefore, for most of the study area, the proposed changes would not be visible or perceptible. Even from the park, those residential uses that are not buffered from the yard, the changes proposed with the Preferred Alternative would largely not be visible or perceptible. All proposed changes would occur within Fresh Pond Yard and therefore would not affect access to any community facilities. Overall, therefore, the Preferred Alternative would not adversely affect the character of the Fresh Pond Yard study area, or the population living in that study area.

Highbridge Yard

The Preferred Alternative would also increase rail activity at Highbridge Yard. However, this change would not adversely affect nearby residential uses or parks, since the yard is buffered from surrounding neighborhoods by the Major Deegan Expressway and the Harlem River. The re-use of Highbridge Yard for rail freight activity would not conflict with the proposed use of the abandoned rail right-of-way to the east for a bicycle/pedestrian path. While views of the yard from some apartments in the study area and from Highbridge Park would change, the change would not be adverse. Overall, therefore, the Preferred Alternative would not adversely affect the character of the Highbridge Yard study area, or the population living in the study area.

MITIGATION

No significant adverse impacts on social conditions—including neighborhood character, community facilities, and relevant population and labor force characteristics—were identified, and therefore, no mitigation would be required. ❖

Chapter 5: Economic Conditions

A. INTRODUCTION

This chapter examines the potential effects of the project alternatives on economic conditions in the Long Island Transportation Corridor (LITC), which consists of Nassau and Suffolk Counties, Brooklyn, Queens, and Manhattan. It considers the key economic factors that are typically served and supported by the region's transportation system, focusing on employment and related real estate trends that illustrate the health of the economy.

This analysis considers the same study areas as the analysis of land use, zoning, and public policy (in Chapter 3), and of social conditions (in Chapter 4), since economic conditions are closely related to land use and social conditions. As in Chapters 3 and 4, the discussions of existing conditions, changes expected to occur in the future, and probable impacts of the alternatives begins with the Long Island Transportation Corridor, followed by the Manhattan study area, the Long Island City/Sunnyside study area, Long Island (for this EIS, defined to be Nassau and Suffolk Counties), and study areas surrounding affected yards. The chapter considers the alternatives' effects once operational. Effects on economic conditions during construction are evaluated separately in Chapter 17, "Construction and Construction Impacts."

B. REGIONAL OVERVIEW

POST-WAR TRENDS

In the course of the 20th century, the economy of the Long Island Transportation Corridor has been transformed from one largely based on manufacturing and agriculture to one fueled by a wide range of services, as well as finance, insurance, and real estate (referred to as FIRE), and the clear distinction that once existed between the economies of New York City and Long Island has gradually disappeared. Prior to World War II, manufacturing was a major employer in Manhattan and New York City as a whole, providing approximately 1 million jobs in 1950.* The city's port and railroads made it one of the world's greatest centers of commerce. In contrast, on Long Island the key industries were farming, fishing, and shipbuilding until World War II. As the region moved out of the post-war era, employment in New York City stabilized, while Long Island began to experience significant growth. Though generally retaining the same level of employment through an increase in office type employment in the FIRE and service sectors, Manhattan lost a significant portion of its manufacturing jobs to suburban communities. In turn, the once primarily farm land of Long Island began to develop into car based suburbs with an increasing share of manufacturing employment. Beginning in the 1980's as national economic trends saw the continued decline of manufacturing and the rise of service sector employment, manufacturing also began to be replaced with service sector jobs on Long Island.

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* Source: Moss, Mitchell L., "Technological Trends Affecting the Manufacturing Sector of New York City," *Economic Policy Review*, February 1997.

NEW YORK CITY

Total private sector employment in New York City remained very close to 3 million between 1956 and 1995. Since World War II, however, the composition of these jobs has changed, as manufacturing sector employment has steadily declined. The trends in Manhattan followed the same pattern, with overall private sector employment remaining close to 2 million between 1960 and 1990. As in the city as a whole, employment in manufacturing during that period declined notably, from about 525,000 manufacturing jobs in 1960 to 186,600 in 1990. One of the principal events contributing to the post-war decline in manufacturing in the city was the development of the interstate highway system, which freed manufacturers from their dependence on city rail systems and piers. The shift in manufacturing operations out of New York City was also encouraged by the post-war migration of residents from the city to the suburbs, with employers following in pursuit of the labor pool. With the total number of jobs remaining steady but the number of jobs in the manufacturing sector falling, the composition of employment in New York City has changed significantly since World War II. The lost manufacturing jobs have been replaced by the growing service and FIRE sectors.

Corresponding to the changes in types of employment in Manhattan are shifts in the location of jobs. Today, the white collar workforce of FIRE and service industries is concentrated in Midtown Manhattan and the Financial District, with the remaining manufacturing pushed to the edges of the Central Business District (CBD) in neighborhoods like the Lower East Side, Tribeca, and the Garment Center. The change in the location and type of jobs has spurred development of office towers and the conversion of loft space to offices. At the same time, the shift in workplace location and type from manufacturing to office employment has changed the demands for the region's commuter rail system. Manufacturing and warehouse-related jobs were typically distant from the centralized commuter rail system, in areas that were not densely developed. In contrast, the density and centralization of white collar workers in Manhattan results in intensive use of the regional rail system.

NASSAU AND SUFFOLK COUNTIES

Beginning in the 1950's, as increased automobile ownership facilitated suburban residential development, the economic character of Long Island shifted dramatically from agricultural to manufacturing. New types of industrial activity appeared, most significantly the manufacture of aircraft and related products (including substantial activity related to the defense industry), while farming, long the mainstay of the Long Island economy, virtually disappeared in Nassau County. The suburbs provided sufficient land to adapt assembly line production techniques to manufacturing, as well as an escape from high taxes, inadequate rail infrastructure, union work rules, extensive regulation, increasingly unskilled labor, and crime that seemed to characterize the city.*

Suburban residential development, particularly in Nassau County, was closely followed by development of substantial retail shopping centers and highway commercial strips, transferring a portion of the city's retail sales to Long Island. Through the 1980's, retail and wholesale employment in Long Island increased, as Manhattan's employment in these industries decreased. Retail and wholesale trades are currently the second largest employers in Long Island.

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* Source: Moss, Mitchell L., "Technological Trends Affecting the Manufacturing Sector of New York City," *Economic Policy Review*, February 1997.

As a result of this suburban development and expansion of the defense industry, employment on Long Island nearly doubled between 1975 and 1990, from 673,500 to 1,100,800. However, the economic downturn of the early 1990's, particularly the downsizing in the defense industry, took a toll on Long Island's economy. Private sector employment began to decrease in the early 1990's, and did not regain its previous high level until 1997, when the effects of growth in the service sector during the 1990's overcame the losses in defense and manufacturing employment. Today, unemployment in both Nassau and Suffolk Counties is low, at 3.3 and 4.2 percent (July 1999), respectively (compared to 8 percent in New York City and 4.5 percent nationwide). Growth in the service industries has generated an office boom on Long Island with low vacancy rates and construction of office space throughout the late 1990's. Conversions and expansions of facilities by major companies headquartered on Long Island illustrate this trend.

Tourism also plays an important role in the Long Island economy, with an estimated annual impact of $7 billion. And although industrial development after World War II drastically changed the economic base of Suffolk County, agriculture remains a prominent industry, so that today Suffolk County is New York States's leading agricultural producer, based on the value of its farm products.

NEW YORK'S ROLE AS AN INTERNATIONAL BUSINESS CENTER

As the heart of a geographically large and economically powerful region, Manhattan is the center for finance and investment, the arts and higher education, medical research and health care, fashion design and wholesaling, media and communications, and tourism. Today, Manhattan is home to nearly 50 headquarters of Fortune 500 corporations, including world-renowned FIRE firms, such as Citicorp, Metropolitan Life Insurance, and Morgan Stanley Dean Witter; communications giants, such as AT&T, Bell Atlantic, and Time Warner; entertainment companies, such as Viacom and CBS; consumer products companies, such as Bristol-Myers Squibb, Colgate-Palmolive, and Estee Lauder; publishers, such as McGraw-Hill and The New York Times; and retailers, such as Woolworth (which operates Foot Locker and other retail stores) and Barnes & Noble. In 1997, these and other Fortune 500 corporations in New York City generated revenues of approximately $685 billion. This agglomeration of corporate headquarters, and consequently key decision makers, is an important asset in New York's struggle to maintain a leadership role in the global economy. In addition, the concentration of corporate headquarters generates increasing demand for a wide range of service industries, as indicated by the rapid expansion of business services in Manhattan.

The surge in the stock market after the recession of the early 1990's strengthened the city's role as a global business center and as a preferred location for FIRE industries. Even with the onslaught of Internet trading, financial markets continue to expand in the city, including the recent construction of the Mercantile Exchange in Battery Park City, as well as the planned expansions of the Nasdaq and the New York Stock Exchange. Other major FIRE employers, including American Express and Merrill Lynch, have made large commitments to remain in the city. Service industries that support FIRE industries have expanded nearby, intensifying employment in the Midtown and downtown areas. For example, as shown in Figure 5-1, FIRE industries continue to be the major employers in the financial district, as well as slightly north in Tribeca, in the East Midtown area between 40th and 49th Streets, and in the West Midtown area between 48th and 59th Streets. Legal and business services that support FIRE industries, such as computer facilities and data processing, are major employers in locations adjacent to these areas. In addition, the vitality of the city's economy has spurred considerable office construction and renovation activity, particularly in the revitalized Times Square area, the Flatiron District, and the emerging Silicon Alley, as many firms find the city's Central Business District (generally the area south of 60th Street in Manhattan) more attractive.

For some firms, the benefits of close proximity to other, related firms outweighs potential cost savings of relocating from the CBD to the suburbs. Firms like Prodigy Computer Service, which has moved its corporate headquarters from White Plains to New York City, place a premium on face-to-face contact and the rapid exchange of new and innovative ideas. In addition, the need for highly educated and skilled labor has become increasingly important to high tech firms. Consequently, a number of firms have relocated their offices to New York City.

On the other hand, the advent of new technology and new methods of communication, such as e-mail and teleconferencing, has made some kinds of office activities less dependent on face-to-face contact (although telecommuters remain a very small percentage of the area's workforce). As this occurs, the relative attractiveness of a CBD location decreases somewhat. In addition, executives and business owners who usually make the decisions about office locations sometimes prefer to bring their offices or industrial plants nearer their homes. Nonetheless, the importance of Manhattan as one of the premier centers of global commerce is not likely to diminish, particularly if contributing factors, including transportation infrastructure, continue to offer the quality of service, mobility, and accessibility that these industries demand.

RELATIONSHIP OF TRANSPORTATION AND ECONOMIC CONDITIONS

Economic conditions are closely related to transportation service. Transportation serves the region's workers in their daily journeys to work. As the New York metropolitan area has grown over the last century, its journey-to-work patterns have changed, so that commuting patterns today are different from those that existed when the public transportation and regional rail systems were established. In Manhattan, the change from a primarily blue collar, manufacturing workforce to a primarily white collar service industry workforce has led to a change in commuters' transportation patterns. The current workforce uses public transportation, particularly commuter rail, more heavily in its commute to centralized, densely developed, business centers. These conditions both support and depend on a functional rail-based transit system. Economic growth is projected for the New York metropolitan region and functional transit service is needed to realize this growth and retain economic activity in the region.

New York City's status as one of the world's principal business centers is in large part supported and made possible by its mass transportation network. Current transportation and economic literature clearly indicates that the quality of transportation infrastructure is one of the most pertinent criteria for companies when seeking a location. Regional mobility is a critical factor in companies' decisions about where to locate, primarily because of the accessibility and convenience it gives employees in their daily journeys to work. Accessibility plays an important role in defining the labor pool from which a company may draw and thus affects the company's ability of the company to hire workers. Moreover, individuals in upper management responsible for decisions about a company's location are more likely to select locations with commutes convenient to them. Thus, the region's transportation system is a critical factor in its business retention and growth, and consequently in its overall economic health. Although some municipalities in neighboring counties and states entice corporations to leave New York with financial incentives, mass transportation and the ability to move large numbers of workers to and from their jobs efficiently, comfortably, and economically remains one of the city's key advantages. The Long Island Rail Road (LIRR) plays an essential role in the city's ability to retain and attract businesses by linking the skilled and highly educated labor force living on Long Island with jobs in Manhattan.

C. EXISTING CONDITIONS

LONG ISLAND TRANSPORTATION CORRIDOR

The Long Island Transportation Corridor constitutes a large part of the New York metropolitan area, including Manhattan, Queens, Brooklyn, and Long Island (Nassau and Suffolk Counties). It contains the region's CBD, generally defined as Manhattan south of 60th Street, including Midtown Manhattan and Wall Street; Queens, the city's most populous borough, which contains commercial downtown centers and major industrial areas; and Nassau and Suffolk Counties, which originally developed as major suburbs of Manhattan.

EMPLOYMENT TRENDS

Employment in the LITC has remained stable, at slightly less than 4 million employees, over the past decade. A temporary decline in employment in the mid-1990's coincided with and can be largely attributed to the national and regional economic recession. The LITC has followed national trends by experiencing an increase in the share of service and FIRE sector employment in the economy.

Most of the employment in the LITC is concentrated in Manhattan, the region's economic center. As shown in Table 5-1, employment in Manhattan (1.9 million jobs) constituted nearly half of the LITC's total employment of 4.1 million jobs in 1995. Brooklyn had the second-highest share, with 674,000 jobs, or 16 percent of the LITC's total employment. Queens, Nassau, and Suffolk Counties each had roughly 12 to 13 percent of the total employment.

Table 5-1

LITC Employment: 1995

	Employment	Percent of Total LITC Employment
Nassau	550,772	13.23%
Suffolk	513,562	12.34%
Nassau & Suffolk	**1,064,334**	**25.57%**
Manhattan	1,873,319	45.00%
Queens	550,727	13.23%
Brooklyn	674,363	16.20%
Total LITC	**4,162,743**	**100.00%**

Source: Urbanomics (9/20/95), as reported in LIRR East Side Access *Ridership Forecasting Results Report* (7/13/99).

As shown in Table 5-2, of all types of private-sector jobs in the LITC, service jobs are the most common (at 38.7 percent). While total private sector employment has remained relatively unchanged—at approximately 3.7 million jobs—over the past 8 years, service industries, already the major employer in the region, grew by approximately 145,000 jobs or about 11 percent during the decade. While employment in all the major service industries increased during the decade, the largest increase occurred in health services, adding nearly 67,000 jobs, or about a 23 percent increase. Today health services employ slightly less than 10 percent of all private sector employees in the region. In the FIRE sector, employment is currently about 6 percent lower than it was in 1990, although all of the decline occurred between 1990 and 1995. Since 1995, the FIRE sector has experienced an increase of approximately 9,000 jobs or about 2 percent in 3 years, and the industry now accounts for slightly less than 15 percent of total private sector employment. As described above, employment in manufacturing throughout the LITC continues to decline. In this decade, more than 108,000 manufacturing jobs were lost, representing about a 23 percent decline. Manufacturing now provides less than one-tenth of total private sector employment in the region.

Table 5-2

Recent Selected Private Sector Employment Trends: LITC

Type of Employment	1990		1995		1998	
	Employment	Percent of Total	Employment	Percent of Total	Employment	Percent of Total
Manufacturing	464,248	12.34%	367,804	10.39%	355,941	9.47%
Transportation and Utilities	256,329	6.81%	232,486	6.57%	242,447	6.45%
Wholesale and Retail Trade	781,324	20.77%	759,432	21.45%	794,187	21.13%
Finance, Insurance, Real Estate	576,490	15.33%	531,584	15.02%	540,697	14.39%
Services	1,309,012	34.80%	1,338,853	37.82%	1,454,204	38.70%
Business	302,602	8.05%	276,626	7.81%	336,266	8.95%
Health	296,789	7.89%	347,158	9.81%	364,739	9.71%
Educational	99,574	2.65%	100,249	2.83%	115,419	3.07%
Engineering and Management	128,419	3.41%	118,015	3.33%	127,884	3.40%
Total Private Sector	3,761,275	100.00%	3,540,347	100.00%	3,757,696	100.00%

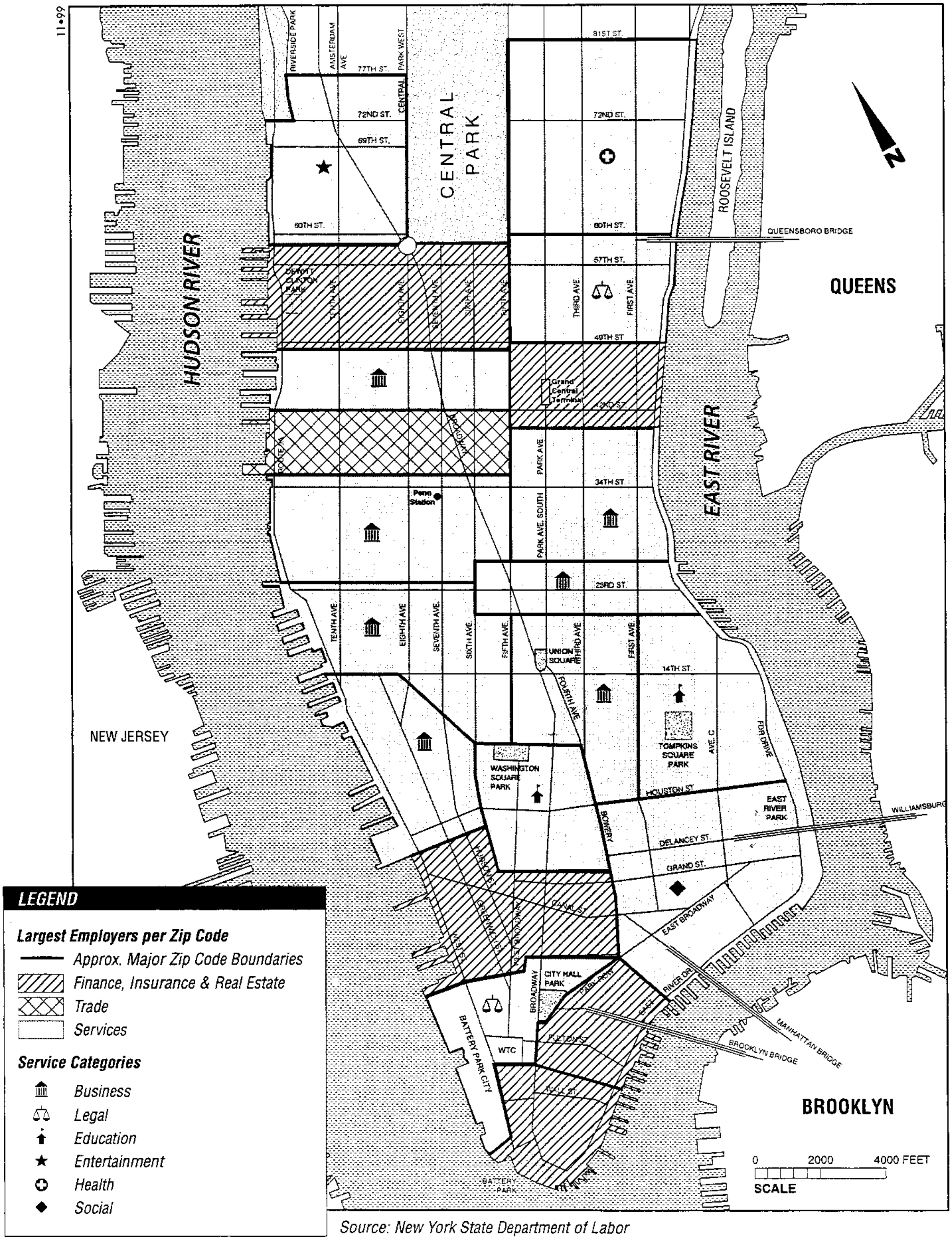
Note: Total includes employment types not shown here.

Source: New York State Department of Labor, Division of Research and Statistics, annual average employees covered by unemployment insurance.

REAL ESTATE TRENDS

To support all its jobs, the LITC includes a significant supply of real estate. This supply is part of the attraction of the LITC, and particularly Manhattan, as a place to locate a business. Trends in the real estate market related to labor markets are a key indicator of the health of the region's economy—i.e., low vacancy rates demonstrate a robust economy, while high vacancy rates indicate shrinking jobs. Real estate trends also illustrate the type of jobs and their locations in the LITC.

Positive trends in the LITC real estate market since the mid 1990's are a reflection of a region experiencing a robust economy since the mid 1990's. Office and industrial market vacancy rates are low in all areas of the LITC and have triggered new construction, particularly in the Manhattan and Long Island markets. There is a strong preponderance of office space in the Manhattan CBD. In areas outside Manhattan's CBD in Queens, Brooklyn, and Nassau and Suffolk Counties, manufacturing space constitutes a larger portion of total real estate. Due to the increase in the importance of the FIRE and service sectors in the region, smaller nodes of office development or secondary business districts have developed outside of Manhattan since the mid 1980's. These include downtown Brooklyn, Long Island City in Queens, Mineola, and Hempstead in Nassau County, and the Huntington Route 110 Corridor in Suffolk County.



Source: New York State Department of Labor

Figure 5-1

1998 Major Private Employment Categories

MANHATTAN STUDY AREA

Manhattan south of 60th Street is one of the largest and the most densely developed employment centers in the world and the regional CBD of the LITC. It is home to the majority of jobs in the LITC.

EMPLOYMENT TRENDS

The recession of the late 1980's and early 1990's that affected the region and the nation as a whole had a very tangible effect on private sector employment in Manhattan. As shown in Table 5-3, private sector employers in Manhattan eliminated approximately 172,000 jobs between 1990 and 1995, with total private sector employment falling from about 1.9 million to 1.7 million, a loss of more than 9 percent in 5 years. Employment in wholesale and retail trade and FIRE sectors experienced slightly higher losses of 10.6 and 10.9 percent, respectively. In the FIRE industries the loss amounted to nearly 50,000 jobs. Service industries fared slightly better during this period, with a loss of approximately 32,000 jobs or about 4 percent decline. At the same time, however, employment in health services in Manhattan soared, with the addition of nearly 17,000 jobs and a significant 16.7 percent increase. Manufacturing employment continued its decline in Manhattan, losing nearly 34,000 jobs between 1990 and 1995, resulting in a substantial 18 percent drop in the 5-year period.

Table 5-3

Recent Selected Private Sector Employment Trends: Manhattan

	1990		1995		1998	
Type of Employment	Employment	Percent of Total	Employment	Percent of Total	Employment	Percent of Total
Manufacturing	186,575	10.04%	152,870	9.07%	145,360	6.42%
Transportation and Utilities	109,078	5.87%	94,111	5.58%	93,973	4.15%
Wholesale and Retail Trade	335,254	18.05%	299,800	17.79%	320,657	14.17%
Finance, Insurance, Real Estate	449,837	24.21%	400,656	23.77%	411,124	18.17%
Services	736,010	39.62%	703,959	41.76%	774,765	34.23%
Business	206,944	11.14%	178,269	10.58%	226,376	10.00%
Health	100,482	5.41%	117,089	6.95%	125,314	5.54%
Educational	57,524	3.10%	57,202	3.39%	67,401	2.98%
Engineering and Management	92,096	4.96%	80,047	4.75%	86,158	3.81%
Total Private Sector	1,857,702	100.00%	1,685,655	100.00%	2,263,161	100.00%

Note: Total includes employment types not shown here

Source: New York State Department of Labor, Division of Research and Statistics, annual average employees covered by unemployment insurance.

Beginning in the mid-1990's, economic conditions improved for most industries, and overall, the increase in private sector employment in the 3 years between 1995 and 1998 nearly eliminated the losses of the recession. Approximately 131,500 jobs were added by private sector employers in Manhattan, or about an 8 percent gain. Wholesale and retail trade recaptured about 21,000 of the 35,000 jobs it lost earlier in the decade. FIRE industries were less successful, recapturing only about 10,500 of the nearly 50,000 jobs lost earlier in the decade. Service industries, however, experienced huge gains in employment, adding nearly 71,000 jobs between 1995 and 1998. Among these were an additional 8,200 health service jobs. Despite the increases in jobs overall, however, manufacturing jobs continued to decline, losing about 7,500 jobs between 1995 and 1998, or another 5 percent drop.

As shown in Table 5-4, business activity is concentrated in three areas—Lower Manhattan, East Midtown, and Midtown. In fact, the two areas with the highest employment, Lower Manhattan and East Midtown, alone contained about 778,000 employees and accounted for about 47 percent of the total employment in the study area in 1995. When the Midtown subarea is added, these three areas contained about 988,000 employees and accounted for about 59 percent of the 1995 total study area employment. Employment is considerably less concentrated in other portions of the Manhattan study area. The different subareas that make up the Manhattan study area are discussed below and shown in Figure 5-1.

Table 5-4

Manhattan Study Area Employment: 1995

Area	Employment	Percent of Study Area Employment
Lower Manhattan	397,774	23.93%
Village/Lower East Side	159,399	9.59%
Chelsea	25,592	1.54%
Lower Fifth	84,849	5.10%
Midtown South	137,442	8.27%
Garment Center	86,333	5.19%
Clinton	38,271	2.30%
Midtown	209,453	12.60%
East Midtown	380,350	22.88%
Lincoln Square	31,884	1.92%
Upper East Side	110,936	6.67%
Manhattan Study Area	**1,662,283**	**100.00%**
Other Manhattan	211,036	—
Total Manhattan	**1,873,319**	—

Source: Urbanomics (9/20/95), as reported in LIRR East Side Access *Ridership Forecasting Results Report* (7/13/99).

Lower Manhattan

With nearly 400,000 employees representing nearly 24 percent of study area employment, Lower Manhattan is the subarea with the highest employment. FIRE sector employment, particularly securities and related business services, dominates in the Lower Manhattan area (see Figure 5-1). FIRE sectors have substantially recovered from the loss of jobs in early 1990's, and combined with the influx of Internet and high technology jobs, demand for office space, both new and renovated, is high.

Village

The Village area, which includes the Lower East Side, is a center for retail employment. Service industries and design-related firms have begun to replace a dwindling number of manufacturing operations, particularly garment manufacturing, which are located in loft buildings in the Lower East Side portion of the subarea.

Chelsea

Chelsea has the lowest level of employment in the study area. With little over 25,000 employees this subarea accounts for less than 2 percent of the study area employees.

Lower Fifth Avenue

Service industries, particularly business services, are the principal employer in the Lower Fifth subarea. The Lower Fifth subarea is also a retail center with retail concentrations along the Avenue of the Americas and Seventh Avenue.

Midtown South

Midtown South has strong service sector employment, as a result of demand for smaller blocks of office space close to Midtown.

Garment Center

The Garment Center area, which includes the south side of 42nd Street, has grown as a major business, tourism, and retail center. Ongoing redevelopment of 42nd Street and the Times Square area with major new office buildings and conversion of manufacturing and wholesaling space in the traditional Garment Center south of 42nd Street, has combined with convenience to key transportation facilities, including the Port Authority Bus Terminal, Grand Central Terminal, Penn Station, and the Hudson River ferries, to increase the attraction of this area in recent years.

Clinton

The Clinton subarea is primarily a residential district. No major office or industrial development is located in this subarea.

Midtown

Midtown is the third largest subarea employer as well as a major employment center in the Manhattan CBD. Revitalizing the area throughout the 1990's, the 42nd Street Development Project has provided opportunities for the recent healthy office, entertainment, retail, and hotel development. With a high market demand for office space, Midtown is an area that has experienced sizable growth, and was home to some 13 percent of Manhattan employment in 1995.

East Midtown

With some 23 percent of the jobs in the Manhattan study area, East Midtown has the second highest concentration of jobs of the subareas. East Midtown is home to many corporate headquarters, particularly in the banking and finance industry.

Lincoln Square

The Lincoln Square subarea is a predominantly a residential district with a few large communications, institutional, and cultural employers. Both the Capital Cities/ABC and CBS studios and related offices are major employers, as are Lincoln Center for the Performing Arts and nearby institutions of higher education, such as Fordham University and John Jay College. Overall, this subarea has the lowest number of employees within the Manhattan study area, about 32,000 in 1995.

Upper East Side

The Upper East Side is one of the principal residential concentrations in the Manhattan study area. Hospitals and local retail and commercial establishments are the subarea's major employers.

REAL ESTATE TRENDS

As shown in Table 5-5, there are nearly 400 million square feet of office building space in Manhattan today, making it the world's largest commercial real estate market. This magnitude of space not only supports Manhattan's employment, it is also a key factor in the attractiveness of the LITC, and particularly Manhattan, as a place to locate a business. By mid-year 1999, the overall vacancy rate in the Manhattan study area was a very low 8.0 percent of total inventory, according to Cushman & Wakefield's *1999 Mid-Year Report*. The average annual rental rates for Class A space in the table illustrate the relative strength of the market and attractiveness of each area for office development. As shown in the table, Midtown Manhattan (which in the table includes the East Midtown and Midtown subareas) is the area most attractive to prospective tenants, and can therefore support higher rental rates.

Table 5-5
1999 Manhattan Office Market Statistics

Market	Number of Buildings	Square Feet Inventory	Overall Mid-Year Vacancy Rate	Average Class A Rental Rate (annual rate per square foot)
Midtown	782	222,468,391	7.5%	$48.11
Midtown South	385	60,747,594	7.1%	$34.48
Lower Manhattan	229	107,691,746	9.6%	$39.02
Total	**1,396**	**390,907,731**	**8.0%**	**NA**

Note: As defined here, Midtown is the area generally south of 70th Street to 30th Street on the West Side and 32nd Street on the East Side, Midtown South is the area generally south of Midtown to Canal Street, and Lower Manhattan is generally the area south of Canal Street.
Source: Cushman & Wakefield Research Services, Market Report, New York New York, Mid-Year 1999.

Since the 1960's there has been a significant expansion in the amount of office space located in Lower Manhattan and Midtown, triggered by the development of the World Trade Center in Lower Manhattan and the Avenue of the Americas corridor in Midtown. Subsequent large-scale office development included replacement of older office buildings in Lower Manhattan with modern office complexes like Chase Manhattan Plaza and other skyscrapers. A new generation of office buildings also came to the emerging Midtown South area with the construction of the Penn Plaza complex on the site of the former Penn Station. In Midtown, Park and Third Avenues experienced substantial growth in the late 1960's and early 1970's, led by Citicorp Center, the D + D Building, and numerous publishing houses in the same vicinity. The economic recovery of the 1980's generated new large-scale office developments, such as the World Financial Center in Battery Park City and Worldwide Plaza in West Midtown. Continuing development of the Midtown area includes recent additions to the office inventory along 42nd Street as part of the revitalization of Times Square, as well as the current construction of 383 Madison Avenue near Grand Central Terminal.

The real estate market continues to be very dynamic throughout the Manhattan study area, with a combination of new firms entering the market and other firms relocating or renegotiating leases. In Lower Manhattan, with approximately 107 million square feet of office space, the FIRE sector dominates, as evidenced by a recent report that estimated that nearly half of the 10 million square feet of office space leased in Lower Manhattan in 1998 was leased by FIRE industry firms. In addition, the new "Silicon Alley" area on Broadway in Lower Manhattan has combined buildings prewired for high-speed Internet access and corporate tax incentives to attract many new high technology firms. The government sector, also a significant employer in Lower Manhattan, absorbed about 2.6 million square feet of space or about one-fourth of all leasing activity in Lower Manhattan in 1998. These trends have had a dramatic effect on Lower Manhattan vacancy rates: while vacancy rates had been more than 20 percent for most of the decade, they have recently declined to 9.6 percent of total inventory in the subarea.*

In the Midtown South area, where the office space inventory totaled over 60 million square feet, more than 5 million square feet of space was leased in 1998. Of these new leases approximately 2 million square feet was absorbed by advertising, publishing, and other communication companies. By mid-year 1999, the real estate market was extremely tight, with the vacancy rate down to 7.1 percent of the total inventory in the subarea. In the Midtown, East Midtown, and Garment Center subareas nearly 21 million square feet of space was leased in 1998, with about 5.6 million or 27 percent absorbed by FIRE industries. Other big players in the Midtown real estate market in 1998 were publishing, legal, and garment center firms. By mid-1999, the vacancy rate had dropped to 7.5 percent of the total inventory.

LONG ISLAND CITY/SUNNYSIDE STUDY AREA

As described in Chapter 3, "Land Use, Zoning, and Public Policy," the Long Island City/Sunnyside study area extends about ½ mile from the site of the proposed Sunnyside station, and includes Yard A, Sunnyside Yard, and parts of the Long Island City and Sunnyside neighborhoods. The study area is home to a diverse employment base, including manufacturing, office, and entertainment companies. Real estate market conditions in Queens as a whole are generally very active, with new tenants reducing the available supply of industrial space and increasing rents.

EMPLOYMENT TRENDS

As shown in Table 5-6, manufacturing employment in the Long Island City/Sunnyside study area declined between 1990 and 1998, following the overall trend in the LITC. In this 8-year period, manufacturing jobs in the study area decreased by 13.5 percent, to about 17,200. However, despite the losses, manufacturing continues to provide approximately one-third of all private sector jobs in the study area; the combination of manufacturing and wholesale and retail trade provides more than 56 percent of the Long Island City/Sunnyside study area's total private sector employment. Service industries in the study area added nearly 1,600 jobs between 1990 and 1998, and currently provide about 17 percent of total private sector employment. Business services, such as computer facilities and data processing, are particularly important job generators in the study area, providing nearly 40 percent of all service industry jobs. Along with the increase in business service employment, the study area has developed a business and professional core in the vicinity of Court House Square, including the Citibank building. FIRE, business, and management services combine to employ nearly 10 percent of all private sector employment in the study area.

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* Source: Cushman & Wakefield Research Services, Market Report, New York, New York Mid-Year 1999.

Table 5-6
Recent Selected Private Sector Employment Trends: Long Island City/Sunnyside

Type of Employment	1990 Employment	1990 Percent of Total	1995 Employment	1995 Percent of Total	1998 Employment	1998 Percent of Total
Manufacturing	19,899	39.45%	16,436	37.48%	17,208	34.36%
Transportation and Utilities	2,308	4.58%	2,480	5.66%	3,017	6.02%
Wholesale and Retail Trade	11,943	23.68%	10,651	24.29%	10,970	21.90%
Finance, Insurance, Real Estate	615	1.22%	659	1.50%	594	1.19%
Services	6,769	13.42%	6,659	15.19%	8,355	16.68%
Business	1,647	3.27%	2,366	5.40%	3,266	6.52%
Health	1,148	2.28%	1,425	3.25%	1,559	3.11%
Educational	NA	0.00%	75	0.17%	120	0.24%
Engineering and Management	313	0.62%	577	1.32%	738	1.47%
Total Private Sector	50,442	100.00%	43,848	100.00%	50,087	100.00%

Notes:
N/A = Numbers too small to be reportable.
Total includes employment types not shown here.
The numbers presented in this table are for an area that is larger than the Long Island City/Sunnyside study area. The area covered here includes all of zip code 11101, which extends from the East River to 39th Street between Broadway and Newtown Creek.
Source: New York State Department of Labor, Division of Research and Statistics, annual average employees covered by unemployment insurance.

REAL ESTATE TRENDS

Queens County overall had a relatively low vacancy rate for industrial space at the end of the second quarter of 1999, at 8.7 percent. Real Estate Weekly reported that demand for industrial space within Long Island City was higher than in other parts of the borough, so the vacancy rate in Long Island City is likely to be lower than the borough wide rate. The study area has been successful in retaining many traditional industrial and manufacturing employers, such as Eagle Electric Manufacturing and Graybar Electric Inc. The area is also home to newer warehousing and manufacturing uses, including those that have relocated from the Manhattan market in recent years. For example, Rex Envelope recently moved from Chelsea in Manhattan to a more industrial location in the southern portion of study area, because rents were more attractive and transportation more convenient for its employees.

The Long Island City economy has undergone notable diversification during the past several decades, particularly as entertainment and design-related industries have moved to the study area. The trend toward increasing office space in Long Island City is typified by the Citicorp building and several industrial buildings recently converted to office space in the vicinity of Court House Square. The prime example of entertainment industry development in the study area is the Silvercup Studios, which converted a famous local bakery to studio space in 1983, and has plans to expand in the southern portion of the study area by converting a manufacturing building to studio use. In addition, P.S. 1, a former school, was converted to a contemporary art museum and several small galleries and art fabrication workshops are also located in the south western section of the study area.

LONG ISLAND

Long Island is primarily suburban in character and supports an economy typical of other suburban areas in the New York metropolitan area with a mix of residential, retail, manufacturing and office type development. Commercial development has expanded on Long Island in the 1990's, with many service related operations and, most visibly, several headquarters of bio-tech and information technology firms requiring an educated workforce but not requiring a Manhattan location.

EMPLOYMENT TRENDS

Conditions in manufacturing industries in Long Island resemble the general declining trend observed in other parts of the LITC. The number of manufacturing jobs dropped sharply to 113,275 from 149,851, or from 13.6 percent to slightly over 10 percent of total private employment in Nassau and Suffolk Counties between 1990 and 1998 (see Table 5-7). At the same time, a major increase occurred in service industry employment, adding more than 54,000 jobs in 8 years. During the 1990's, service industries have increased their share of total private sector employment to 31.5 percent from 27.1 percent. Within the service sector, health services have made the most significant gains in employment, adding nearly 21,000 jobs in 8 years. As a result, health services now employ more than 114,000 workers in Long Island, representing nearly one-third of all service jobs, and providing more jobs than any other employment category, except wholesale and retail trade. While the fastest rate of job growth occurred in health services, business services were not far behind, adding about 10,000 jobs for a 15 percent increase in employment between 1990 and 1998. In all other areas—including wholesale and retail trade, FIRE, and transportation and utilities—employment has regained losses experienced during the regional recession in the early part of the decade and continued to rise. These trends have pushed the unemployment rate to a historic low of 2.7 percent in November 1998. The unemployment rate in Long Island continues to be one of the lowest in the State of New York.

REAL ESTATE TRENDS

While small in comparison to Manhattan's nearly 400 million square feet of office space, Long Island is one of the region's principal real estate submarkets, with a total of 26 million square feet of office space. A strong local economy, supported by substantial increases in service industries, has generated positive trends in the Long Island real estate market. The office market, as well as the industrial market, is experiencing shortages of large blocks of space due to high occupancy levels and lack of new construction, particularly in Class A office space.

The high demand for office space and record low vacancy rate is leading some developers to construct speculative office buildings for the first time since the late 1980's, while others are renovating and converting older buildings to office use. Much of the service sector job growth on Long Island is occurring in biotechnology, high-tech manufacturing, and software development. For example, Computer Associates International headquartered in Islandia is expanding by 360,000 square feet, and Symbol Technologies is adding 125,000 square feet to its facility in Holtsville. As shown in Table 5-8, the vacancy rate for Class A office space in Long Island has declined dramatically since 1990, from 18.3 percent to 9.5 percent at the end of 1998, the lowest level reached in Long Island in decades.

Table 5-7

Recent Selected Private Sector Employment Trends: Nassau and Suffolk Counties

Type of Employment	1990 Employment	1990 Percent of Total	1995 Employment	1995 Percent of Total	1998 Employment	1998 Percent of Total
Manufacturing	149,851	13.60%	113,291	10.60%	113,275	10.10%
Transportation and Utilities	49,950	4.50%	48,939	4.60%	52,120	4.70%
Wholesale and Retail Trade	283,398	25.70%	277,771	26.00%	284,460	25.50%
Finance, Insurance, Real Estate	80,260	7.30%	78,564	7.40%	78,581	7.00%
Services	297,885	27.10%	325,584	30.50%	352,024	31.50%
Business	61,748	5.60%	63,10	5.90%	71,589	6.40%
Health	93,451	8.50%	110,097	10.30%	114,293	10.20%
Educational	19,808	1.80%	20,369	1.90%	22,548	2.00%
Engineering and Management	29,194	2.70%	29,093	2.70%	32,300	2.90%
Total Private Employment	1,100,756	100.00%	1,067,520	100.00%	1,117,202	100.00%

Note: Total includes employment types not shown here.
Source: New York State Department of Labor, Division of Research and Statistics, annual average employees covered by unemployment insurance.

Table 5-8

Long Island Office Market Trends

	1990	1995	1998	Percent Change 1990-1998
Square Feet Inventory	26,470,393	26,039,938	26,099,799	-1.4%
Square Feet New Construction	1,338,895	0	60,000	-95.5%
Overall Vacancy Rate	18.7%	15.9%	9.5%	-49.2%
Class A Vacancy Rate	20.4%	16.4%	6.7%	-67.2%
Class B Vacancy Rate	15.5%	15.4%	12.0%	-22.6%

Source: Cushman & Wakefield Research Services, MarketBeat Series, Long Island New York, Year-End 1998.

Long Island office development is not evenly distributed across the Island. Office space in Nassau County tends to be older and more plentiful than in Suffolk County. Since Nassau County's office space market is more mature, there is less space for new office development to take place. Recent office space development in Suffolk County has taken advantage of the large blocks of space that are still available in this considerably less developed county.

As shown in Table 5-9, nearly two-thirds of Long Island's office space is located in Nassau County and vacancy rates are very low. By the end of 1998, the county had an inventory of 17.5 million square feet of office space with an incredibly low overall vacancy rate of 7.6 percent. All submarkets within the county had vacancy rates much lower than 10 percent in the fourth quarter of 1998. Suffolk County accounts for about 33 percent of the office space inventory on

Long Island, with 8.6 million square feet of office space. The majority of inventory, i.e., 5.6 million square feet of space, is located in the western Suffolk submarket. Although the vacancy rate in this area increased from 9.7 percent to 15.2 percent between year-end 1997 and year-end 1998, much of the vacant space was created by the addition of 369,000 square feet of Class B office space in Melville by Fleet Bank. The overall vacancy rate of 13.3 percent for Suffolk County still reflects a strong office market based on a strong economy.

Table 5-9

Long Island Year-End 1998 Office Market and Submarket Statistics

Market	Number of Buildings	Square Feet Inventory	Overall Vacancy Rate Fourth Quarter 1998	Overall Vacancy Rate Fourth Quarter 1997	Direct Weighted Average Rental Rate (annual rate per square foot)
Nassau County	**148**	**17,465,078**	**7.6%**	**10.4%**	**$26.11**
Western Nassau County	45	4,469,501	6.6%	15.0%	$26.47
Central Nassau County	59	7,995,294	8.3%	8.9%	$7.08
Eastern Nassau County	44	4,991,283	7.2%	8.7%	$24.20
Suffolk County	**105**	**8,643,721**	**13.3%**	**11.0%**	**$24.05**
Western Suffolk County	44	5,609,882	15.2%	9.7%	$24.86
Central Suffolk County	61	3,033,839	9.9%	13.4%	$21.58
Total Long Island	**253**	**26,099,799**	**9.5%**	**10.6%**	**$25.19**

Source: Cushman & Wakefield Research Services, MarketBeat Series, Long Island New York, Year-End 1998.

Manufacturing, warehousing and the industrial real estate market continue to be important factors in the Long Island economy. The strong Long Island industrial market contains more than 200 million square feet of space and currently has low vacancy rates. At year-end 1997, the estimated availability rate for the industrial market stood at 12 percent. In Nassau County, availability is estimated to be 15 percent, while in Suffolk County the market is markedly tighter with the vacancy rate estimated at 10 percent. A strong market has reduced available industrial space to approximately 17 million square feet and spurred new construction.

Like the office market, the currently strong industrial market and the lack of available blocks of space have prompted new construction by developers. A 106,000-square-foot facility in Bohemia is the first major speculative industrial building constructed on Long Island in a decade. The demand for industrial space on Long Island is expected to continue to be strong, and, like the Bohemia project, will likely be used for warehouse/distribution rather than for manufacturing.

YARDS STUDY AREAS

BLISSVILLE YARD

The Blissville study area is occupied by industrial uses involved in the warehousing and transportation of goods, including a Getty Oil storage facility located adjacent to the rail line.

MASPETH YARD

The Maspeth study area is located in a highly industrial section of Queens. Many of the businesses located in the study area, such as United Parcel Service, rely heavily on truck transport of products.

FRESH POND YARD

Industrial and warehouse uses are located adjacent to the rail line in the Fresh Pond study area. Retail businesses in the study area are located on major streets away from and are generally unassociated with the rail yard.

HIGHBRIDGE YARD

The Highbridge Yard study area contains predominantly residential uses, although they are effectively separated from the Highbridge Yard by the Major Deegan Expressway and a substantial change in elevation. Commercial activity is concentrated in local convenience stores and small grocery stores in the ground floor of residential buildings, with little or no connection to the project site. The Harlem River and the Harlem River Drive provide substantial physical barriers and a wide separation between the Highbridge Yard and northern Manhattan to the west.

D. FUTURE CONDITIONS COMMON TO ALL ALTERNATIVES

OVERVIEW OF THE LONG ISLAND TRANSPORTATION CORRIDOR

Future economic conditions were projected in the study area as part of the East Side Access's forecast to 2010 and 2020 of changes in socioeconomic conditions, prepared for use in the ridership model. These projections were based on recent projections by the New York Metropolitan Transportation Council (NYMTC) for the 31-county metropolitan region, and are the same projections being used by MTA's other Long-Range Planning Framework projects (MTA's Long-Range Planning Framework projects are described in Chapter 1). These projections are based on national and regional economic and demographic trends. They assume that the basic infrastructure serving the region—including its transportation systems—remains adequate.

The projections indicate that LITC is expected to experience continued economic growth between 1995 and 2020. Overall, an increase of approximately 900,000 jobs is projected for the regional economy by 2020, resulting in a substantial 21.6 percent increase in employment. Slightly more than half of the growth is predicted to occur by 2010—approximately 552,000 jobs. Employment growth between 2010 and 2020 will continue, with about 347,000 jobs added to the regional economy (see Table 5-10).

Manhattan is projected to lead the way in the number of jobs added to the regional economy, adding about 312,000 jobs by 2010 and an additional 77,000 by 2020. The increase in employment in Manhattan will account for slightly more than 50 percent of the total projected growth in the LITC region between 1995 and 2010, and slightly more than 20 percent between 1995 and 2020. Approximately 312,000 new jobs are projected to be created in Manhattan by 2010, representing a healthy growth of 16.6 percent in total employment. The rate of increase in Manhattan is expected to slow between 2010 and 2020 to about 3.5 percent.

Table 5-10

LITC Employment Trends: 1995 to 2020

	1995		2010		2020		Percent Change		
	Employ-ment	Percent of Total	Employ-ment	Percent of Total	Employ-ment	Percent of Total	1995-2010	2010-2020	Total 1995-2020
Nassau	550,772	13.23%	617,986	13.11%	651,485	12.87%	12.2%	5.4%	18.3%
Suffolk	513,562	12.34%	607,483	12.89%	722,724	14.28%	18.3%	19.0%	40.7%
Nassau & Suffolk	**1,064,334**	**25.57%**	**1,225,469**	**25.99%**	**1,374,209**	**27.15%**	**15.1%**	**12.1%**	**29.1%**
Manhattan	1,873,319	45.00%	2,185,114	46.35%	2,261,887	44.69%	16.6%	3.5%	20.7%
Queens	550,727	13.23%	612,948	13.00%	683,411	13.50%	11.3%	11.5%	24.1%
Brooklyn	674,363	16.20%	690,952	14.66%	741,733	14.66%	2.5%	7.3%	10.0%
LITC	**4,162,743**	**100.00%**	**4,714,483**	**100.00%**	**5,061,240**	**100.00%**	**13.3%**	**7.4%**	**21.6%**

Source: Urbanomics (9/20/95) from LIRR East Side Access *Ridership Forecasting Results Report* (7/13/99).

While Manhattan will continue to be the major employment center, with almost 45 percent of employment in 2020, the greatest growth is projected to occur in Suffolk County. By 2010, Suffolk County is expected to add 94,000 jobs, resulting in an 18 percent increase. The boom in employment in the county is projected to continue to 2020, with an additional 115,000 jobs created, representing a growth of 19 percent over 2010, and nearly a 41 percent gain since 1995.While these gains are dramatic, Suffolk County will continue to represent a relatively minor portion of the total employment in the LITC, growing from 12.3 percent in 1995 to slightly more than 14 percent in 2020. Nassau County is expected to experience a significant rate of increase in employment, though the number of jobs created will be substantially smaller than in Manhattan and Suffolk County. By 2020, Nassau is projected to add 101,000 jobs, a gain of 18 percent. About two-thirds of the increase in employment in Nassau County will occur by 2010. Combined, Nassau and Suffolk County growth will increase Long Island's share of employment from 25.5 percent in 1995 to slightly more than 27 percent in 2020.

Queens will experience a steady increase in employment of about 11 percent by 2010 and again by 2020. Brooklyn will see only minor gains in employment, i.e., a total increase of about 67,000 jobs by 2020, resulting in a 10 percent growth in employment. About four-fifths of the employment growth in Brooklyn will occur between 2010 and 2020.

MANHATTAN STUDY AREA

The Manhattan study area will continue to be one of the largest business and employment centers in the world. Overall, employment in the study area is projected to grow to over 2 million by 2010, creating about 300,000 new jobs, or a 16.6 percent increase from 1995 (see Table 5-11). The rate of growth is projected to continue more slowly between 2010 and 2020, with nearly 77,000 new jobs, representing less than a 4 percent increase.

In 2020, Lower Manhattan, East Midtown, and Midtown will continue have a high concentration of business activity. Lower Manhattan and East Midtown combined will grow at about 17 percent and continue to constitute the bulk of employment in Manhattan, with nearly 45 percent of employment in 2020. These three subareas combined will hold the bulk of the region's business activity, with employment at approximately 1.2 million and containing 58 percent of Manhattan's employment.

Table 5-11

Manhattan Employment Trends: 1995 to 2020

Area	Employment			Percent Change		
	1995	2010	2020	1995-2010	2010-2020	Total 1995-2020
Lower Manhattan	397,774	455,226	467,831	14.4%	2.8%	17.6%
Village/Lower East Side	159,399	178,022	183,738	11.7%	3.2%	15.3%
Chelsea	25,592	41,331	51,853	61.5%	25.5%	102.6%
Lower Fifth	84,849	103,333	107,907	21.8%	4.4%	27.2%
Midtown South	137,442	153,706	156,221	11.8%	1.6%	13.7%
Garment Center	86,333	112,907	119,449	30.8%	5.8%	38.4%
Clinton	38,271	42,783	46,666	11.8%	9.1%	21.9%
Midtown	209,453	268,398	284,269	28.1%	5.9%	35.7%
East Midtown	380,350	441,535	446,222	16.1%	1.1%	17.3%
Lincoln Square	31,884	39,754	43,045	24.7%	8.3%	35.0%
Upper East Side	110,936	124,680	129,423	12.4%	3.8%	16.7%
Manhattan Study Area	**1,662,283**	**1,961,675**	**2,036,624**	**18.0%**	**3.8%**	**22.5%**
Other Manhattan	211,036	223,439	225,263	5.9%	0.8%	6.7%
Total Manhattan	**1,873,319**	**2,185,114**	**2,261,887**	**16.6%**	**3.5%**	**20.7%**

Source: Urbanomics (9/20/95) from LIRR East Side Access DEIS *Ridership Forecasting Results Report* (7/13/99).

Lower Manhattan will continue to be the study area neighborhood with the highest employment through 2010 and 2020. Employment in the subarea is projected to increase to about 455,000 jobs by 2010, about a 14 percent, then stabilize, growing only about 3 percent between 2010 and 2020.

Midtown is expected to continue its role as the core of the Manhattan CBD. Employment in the Midtown subarea is projected to increase by nearly 59,000 jobs between 1995 and 2010, a 28 percent increase. Between 1995 and 2020, growth of 75,000 jobs (35 percent) is projected, for a total of 284,000 jobs in this portion of the study area. East Midtown is expected to see significant growth over the next two decades, growing by 17 percent by 2020. A total of 61,000 new jobs are projected between 1995 and 2010, and another 4,700 jobs by 2020.

Other subareas are also expected to see increases in employment, as shown in the table. Some of this growth is attributable to increasing demand from already strong service and FIRE sectors, while in other subareas, particularly growth in Chelsea, the Garment Center, and Midtown South, increases in the number of jobs would result from shifts in types of employment, i.e., from less intensive manufacturing, warehousing, and distribution to services and FIRE categories.

LONG ISLAND CITY/SUNNYSIDE STUDY AREA

As described in Chapter 3, "Land Use, Zoning, and Public Policy," the rezoning proposed for Long Island City just north of Sunnyside Yard is expected to make it a more densely developed commercial area. This new development is anticipated to bring approximately 42,500 new jobs to the area by 2020, predominantly in service industries and the FIRE sector. Some 29,500 new jobs are projected for 2010 (growth of nearly 57 percent over 1995), and an additional 13,000 jobs are expected by 2020 (resulting in total growth of 82 percent over 1995).

LONG ISLAND

The Long Island study area economy is expected to continue to grow. The overall vacancy rate, which is an indicator of economic health, is expected to remain stable. As commercial rental rates rise, development of additional new construction projects and retrofits of existing buildings will continue as demand for space outpaces supply. Suffolk County will experience a large portion of the new economic activity. As shown in Table 5-10, the employment growth of Nassau and Suffolk Counties is projected at 30 percent between 1995 and 2020. Nassau County is expected to gain 101,000 jobs, a greater than 18 percent increase, and Suffolk County is expected to gain 209,000 new jobs, an approximately 41 percent gain over the same period.

YARDS STUDY AREAS

No significant changes in overall economic conditions or employment are anticipated in the study areas for the Blissville, Maspeth, Fresh Pond, and Highbridge Yards.

E. PROBABLE IMPACTS OF PROJECT ALTERNATIVES

NO ACTION ALTERNATIVE

The No Action Alternative would result in a very small increase in capacity on the LIRR, as a result of the addition of bi-level coaches and five trains in the peak hour to Penn Station. The overall convenience to riders serviced by diesel trains would improve slightly as the result of the addition of dual-mode locomotives that would allow for a one-seat ride to Penn Station, among other scheduled improvements. There would be no addition of service to Grand Central Terminal and the existing disconnect between job location and terminal location would remain. As noted in the description of recent employment trends above, nearly 400,000 employees in the Manhattan study area (23 percent of the study area's employment) work in East Midtown, which is not convenient to Penn Station. The majority of the employees in East Midtown work in the finance, insurance and real estate sectors or in business or legal services—white collar workers who are traditionally heavy users of commuter rail service. Employment in East Midtown is projected to grow by 16 percent by 2010 and by a total of 17 percent by 2020.

The maintenance of the status quo in rail service would directly affect commuter travel patterns, and have wide ranging impacts on the regional economy as well. The most immediate impact would be on daily commuters. Without substantial improvement to the existing system, conditions on the LIRR are likely to worsen for riders, exacerbating overcrowding and delays in service. Ridership statistics help explain how future conditions might deteriorate. Between 1995 and 2010, arrivals at Penn Station in the AM peak hour are projected to increase by approximately 18,600 riders, or 22 percent, and by nearly 24,000 riders (28 percent) between 1995 and 2020. During the peak 15 minutes of the AM peak hour, trains arriving at Penn Station would be operating at 127 percent of capacity. With passenger comfort and delays in service already problematic for many commuters, the projected increase in demand would likely lead to a further decline in the quality of service.

Since the projections of population and employment for the LITC assume no deterioration in transportation service, under the No Action Alternative—with its decline in service—these predicted growth levels may not be achieved. On Long Island, this could mean fewer new residents and possibly lower employment with a concomitant effect on the future local tax base and economic activity. In addition, commuters might adjust their travel patterns to compensate for deteriorating service on the LIRR, with economic impacts on the broader community. As three out of four Long Island residents who commute to the city use the LIRR, a shift from train to auto, the most likely adjustment, would likely exacerbate already congested conditions on major roads leading from Long Island to Manhattan.

Such a shift would affect more than just the rail commuters. It would increase congestion on the roads, increasing the time required for the journey to work by non-transit users, as well as slowing the delivery of goods and services over roads throughout the region. Increasing travel time required for the journey to work and for the delivery of goods and services would increase the cost of doing business, ultimately making the LITC a less desirable location for business. A large body of transportation and economic research and literature indicates that among the most important criteria for selecting a business location are the quality of the transportation infrastructure in an area, the availability and quality of the work force, the sophistication of the information and communications systems, and local taxes and other costs of doing business. While commuter rail transportation makes up only one part of the overall transportation infrastructure of an area, it can affect the quality and delivery of other forms of transportation, as well as the availability of the work force, as described above. Thus, the No Action Alternative could affect the attractiveness of the LITC, and particularly Manhattan, as a business location, undermining the projected employment growth for the region and the economic demand that would be generated by future employees.

As an example, between 1995 and 2020, the Manhattan study area is expected to add about 375,000 employees, for an overall increase of 22.5 percent. This would add approximately $26 billion in annual earnings to the region by 2020, in today's dollars. These earnings would also contribute substantial secondary impacts in terms of spending and taxes on earnings and spending that supports certain public infrastructure and services throughout the region, and New York State as whole. If this employment growth is diminished under the No Action Alternative, even by a relatively small percentage, it will have strong economic repercussions.

TRANSPORTATION SYSTEMS MANAGEMENT (TSM) ALTERNATIVE

The TSM Alternative would provide some improvement in commuter rail service between Long Island and Penn Station. Peak hour capacity would increase by approximately 5,800 riders with the addition of 2 to 4 cars per train, including bi-level passenger cars. Other major improvements that would be provided under the TSM Alternative are increased availability of one-seat rides to Penn Station, increased service to the Hunterspoint Avenue and Long Island City stations, and extension of peak hour contra-flow bus lanes on the Long Island Expressway, among others.

These modifications would improve the journey to work for some LIRR commuters, and secondarily improve the movement of goods and services through the region, as described above in the No Action Alternative. However, the improvements would not be sufficient to avoid the overcrowding and delays that are likely to occur with the projected 22 percent increase in system ridership between 1995 and 2010 and 28 percent by 2020. The existing disconnect between the location of jobs and the location of terminals would not be substantially improved by the implementation of the TSM Alternative.

For many of these employees, the journey to work involves an additional transit trip to their destination, either by subway or bus, and for some it requires a long walk. In most cases, at least 15 minutes to 30 minutes are added to the daily journey to work. The improvements provided under the TSM Alternative, particularly the increased service to Hunterspoint Avenue and Long Island City, would not eliminate, or substantially improve the existing disconnect between the location of jobs and the location of terminals. While the increased capacity in the LIRR system may have some beneficial systemwide effects by reducing current overcrowding, encouraging higher utilization of the western terminals would not resolve the existing disconnect, and is not likely to reduce the overall time required for the journey to work. As noted in Chapter 1, "Project Purpose and Need," there are real and perceived impediments to using the western terminals, including the continuing disincentives of a two-seat ride (be it subway, bus, or ferry), the added cost of the second ride, overcrowding on many of the connecting transit modes, and the psychological resistance to changing modes, among others.

Thus, the TSM Alternative would not significantly improve existing conditions for most LIRR commuters, compared to the level and quality of service that exists today. In the long run, as noted above, improving the quality of service, including reducing overcrowding and delays, as well as remedying the current disconnect between jobs and terminals, is likely to affect the attractiveness of the LITC as a business location. Since the key factors in the selection of business location include the quality of an area's transportation infrastructure, the availability of the work force, and the cost of doing business, the TSM Alternative would make only a minor contribution to the attraction of the region as a business location. It is not likely to provide the level of infrastructure improvement required to support the region's continued ability to retain and attract businesses, which would subsequently dampen projected economic growth, particularly in terms of the projected number of jobs and the economic multiplier effects they would produce. Although the TSM Alternative would likely improve the transportation infrastructure enough to maintain current levels of employment, and probably some growth, the full growth predicted for 2010 and 2020 would be achieved only with difficulty.

PREFERRED ALTERNATIVE

The Preferred Alternative would create two major improvements in the LIRR infrastructure that would have significant beneficial impacts on the region's economy. The first is the provision of new LIRR service to a new LIRR terminal at Grand Central Terminal (GCT), which would also allow a significant increase in the number of peak period trains traveling to Manhattan, from 42 to 61. The second is the creation of a new LIRR station in Sunnyside, Queens. Other proposed changes under the Preferred Alternative that would have less significant impacts include the relocation of Metro-North maintenance and storage facilities to the existing Highbridge Yard in the Bronx, and the relocation of New York & Atlantic Railway (NYAR) railcar storage from Yard A in Sunnyside to either the Blissville Yard or the Maspeth Yard, and relocation of NYAR railcar maintenance shop to Fresh Pond Yard. In addition, construction of the new tunnels and access to GCT would permanently displace several businesses in Queens and Manhattan. These impacts are addressed in a detailed displacement analysis below. Other improvements proposed under the Preferred Alternative, such as ventilation facilities, would have negligible impact on current economic conditions, and are not specifically analyzed.

LITC AND MANHATTAN STUDY AREAS

The most immediate impact generated by the Preferred Alternative for many LIRR users would be the elimination of the existing disconnect between the location of jobs and location of terminals, as well as substantial improvement in the currently overcrowded conditions on many LIRR peak hour trains, and considerable reduction in the time required for the journey to work. These improvements would not only help to accommodate projected LIRR ridership by 2010 and 2020, but would generate an increase in ridership. Additionally non-users of the system would also benefit from improvements created by the Preferred Alternative, as current ridership would be retained and increased by both 2010 and 2020, leading to a reduction in congestion on the major Long Island roadways leading to Manhattan.

There are various methods for the determining economic impacts of transportation improvements, including measuring rates of return on the infrastructure investment, and a more broadly based measurement of how infrastructure investment affects economic growth. As described above for other alternatives, investment in transportation infrastructure is one of the principal factors in retaining and attracting businesses to an area. More specifically, research indicates that infrastructure investment promotes economic growth and productivity.* A recent MTA study (*Lasting Economic Benefits of Public Transit Investment*, Phase 2 final report, prepared by Cambridge Systematics, Inc. for MTA, August 6, 1997) concluded that investments in the region's transportation system beyond the basic amount required to keep the system in a state of good repair would yield an economic return of $2.03 for every dollar invested. Based on the current condition of the infrastructure and quality of service, the reverse is also true for the LITC, i.e., the lack of investment can reduce productivity in the region. With the Preferred Alternative there would not be deterioration in rail transit service acting as a deterrent to regional growth, so compared with the No Action Alternative the Preferred Alternative would have a clear positive impact on productivity within the LITC, and particularly in Manhattan. Elimination of the disconnect between jobs and terminals for many LIRR riders is expected to save between 15 and 30 minutes in the journey to work, or as much as an hour for the daily commute. The time savings would likely translate into increased productivity not only in the workplace but also in the daily lives of commuters, improving the overall quality of life in the region.

Eliminating the disconnect, improving transportation service, reducing travel time, and improving the quality of life would ultimately manifest itself in the ability of the region, particularly Manhattan, to meet its projected growth of 312,000 new employees by 2010 and 375,000 new employees by 2020. Research suggests a strong correlation between infrastructure investment and more openings of new businesses, as well as expansions of existing businesses. Following the trend of the past decade, it is likely that about ⅔ of the projected 2 million employees in the Manhattan study area in 2010 and 2020 would be working in the FIRE and service sectors, traditionally more intense users of commuter rail than the manufacturing sector. As existing and new FIRE and service firms consider business locations, the investment proposed under the Preferred Alternative would count heavily to support the LITC and Manhattan, in particular, as a viable location for business growth. As noted above, achieving the employment projections for Manhattan would generate about $26 billion in new annual earnings (wages and salaries) by 2020 in today's dollars, as well as considerable secondary spending and employment impacts throughout the state.

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* For example, Jeffrey Madrick, *Economic Returns from Transportation Investment*, forum proceedings, Eno Transportation Foundation, Inc., 1996; New York Citizens Budget Commission, *Transportation Infrastructure and New York's Competitiveness*, June 29, 1999; Julie Hoover, *Making the Case for Public Transportation: A Corporate Perspective*, paper presented at the New York Public Transit Association Winter Conference, Albany, NY, February 23,1998; Cambridge Systematics, Inc. for MTA, *Lasting Economic Benefits of Public Transit Investment*, Phase 2 final report, August 6, 1997.

An estimated 62,000 LIRR passengers are projected to commute to GCT during the morning peak period (6 AM to 10 AM) in 2010, and some 76,000 passengers would arrive at GCT daily in 2010. By 2020, 66,000 passengers would ride LIRR to GCT during the morning peak period, and 81,000 would use the new service into GCT daily. These new passengers in GCT would very likely generate additional spending by commuters for retail businesses and services in and around the GCT area, as commuters purchase fast food and convenience items, use services such as beauty salons and travel agents, and utilize restaurants for business and personal engagements. At the same time, once the new service to Grand Central Terminal is available, fewer LIRR commuters would arrive at or depart from Penn Station. In 2010, there would be 46,000 fewer commuters arriving at Penn Station in the AM peak period compared to the No Action condition (or 29,000 fewer compared to 1995 conditions); in 2020, some 48,000 fewer LIRR passengers would arrive at Penn Station in the AM peak period compared to the No Action condition (or 24,000 compared to 1995). The reduction in passengers at Penn Station would decrease annual spending in and around Penn Station at local retailers. The decrease in spending would not constitute a significant adverse impact.

LONG ISLAND CITY/SUNNYSIDE

As described earlier, in the future Long Island City is expected to become an important business district. Employment in Long Island City is projected to grow from 52,000 to about 81,000 by 2010 and 95,000 by 2020, an increase of about 57 percent by 2010 or 82 percent by 2020. Although the area is currently well served by subways, the location of a new LIRR station under the Queens Boulevard overpass in Sunnyside would increase accessibility to the area for the Long Island work force. Expanding direct links to the work force in a wider region would make Long Island City a more attractive location for the growing service industries in the area, particularly business services, since a larger labor pool with a broader range of skills would be more readily accessible. In the long run, the Preferred Alternative would enhance opportunities for future development in Long Island City, where nearly 4 million square feet of office space are currently planned.

In addition, the combination of midday railcar storage and the proposed new station would very likely increase employment, and thus consumer expenditures by railroad employees (and commuters) in the vicinity of Yard A.

LONG ISLAND

While the principal economic impacts of the Preferred Alternative would be felt in the Manhattan study area, Long Island would also benefit from the infrastructure improvements in several ways. The attraction of an area as a business location is not only based on the transportation infrastructure, but also on the availability of the work force. Improving the quality of rail service, reducing overcrowding, reducing travel time, and connecting more directly with centers of employment would improve the daily commute of over 100,000 riders daily who use LIRR to reach Penn Station during the AM peak. Since transportation on Long Island is problematic in every mode, investing in LIRR infrastructure is likely to improve the quality of life on Long Island for users and non-users of the system alike, i.e., improved rail service would also reduce traffic congestion, both of which would support the attraction of Long Island as a desirable residential location. Population growth (and thus, growth in the work force) projected for Long Island would be more readily achievable under the Preferred Alternative.

For the same reasons, Long Island's projected employment growth of 160,000 by 2010 and 310,000 by 2020 would be more easily attainable with the improvements of the Preferred Alternative, which would indirectly reduce congestion on major roads by increasing ridership and preventing existing riders from shifting transportation mode from rail to auto.

YARDS STUDY AREAS

There would be only minor impacts on economic conditions in and around the rail yards involved in the Preferred Alternative. Primarily, the Preferred Alternative would shift employment to Highbridge Yard, Fresh Pond Yard, and Blissville or Maspeth Yard, probably resulting in a small increase in spending by railroad employees at local retailers and service businesses.

DIRECT DISPLACEMENT

In the Preferred Alternative, the new tunnel and additional entrances to Grand Central Terminal and improvements at Harold Interlocking in Queens would require either full or partial acquisitions of property in both Manhattan and Queens (see Table 5-12 and Figures 5-2 and 5-3). Some property acquisitions would result in the direct displacement of businesses. None of the alternatives would require the direct displacement of residences.

As described below, the potential property acquisitions would occur during construction of the project, and most would be permanent. The required acquisitions would differ in Manhattan, depending on which engineering option is selected. For all potential acquisitions, surveys were conducted in fall 1999 to identify businesses that would be affected. The total estimated employment in businesses that currently occupy affected, based on current designs properties is approximately 285 (see Table 5-12). However, about 100 employees in a building to be acquired on Barnett Avenue in Queens work for an office cleaning business at other job sites, i.e., not in the property that would be acquired.

Potentially Affected Properties in Manhattan

The two engineering options being studied for the Preferred Alternative would require different property acquisitions in Manhattan. Option 1 (new tracks and platforms in GCT's existing lower level) would require acquisition of private property for a ventilation facility, new entrances, and a new portion of tunnel west of Park Avenue, while Option 2 (new tracks and platforms below GCT's existing lower level) would require acquisition of private property for the ventilation facility and new entrances (not all in the same locations as for Option 1), but not for the new tunnel section, as described below.

Properties Affected Under Option 1.

47 East 44th Street. The Preferred Alternative would require the acquisition of the entire building at 47 East 44th Street and its subsequent demolition to provide space for a ventilation structure. Located at midblock (see Figure 5-2), 47 East 44th Street is a 5-story building containing Dishes, a restaurant of about 2,500 square feet; and 10,000 square feet of Class B office space. There are three office tenants occupying the top three floors. The second floor is vacant.

Table 5-12
Potential Property Acquisitions Required and Potentially Displaced Businesses

Option 1 or 2	Address/Description of Affected Property	Business type	Estimated Occupied Sq. Ft. of Affected Business	Estimated Number of Employees
Manhattan				
1 or 2	47 East 44th Street 5-story office building with ground-floor retail	Restaurant	2,500	9
		Office	7,500	30
1 or 2	347 Madison Avenue Ground-floor space in 20-story office building	Optical	1,500	5
		Retail	1,500	5
		Retail (vacant)	1,500	0
1 or 2	245 Park Avenue Sidewalk space near 45-story office building	NA	NA	0
1 or 2	270 Park Avenue Sidewalk space near 52-story office building	NA	NA	0
1 or 2	280 Park Avenue Ground-floor space in 28-story office building	Restaurant	5,000	17
1	200 Park Avenue Sidewalk space used for outdoor cafe seating adjacent to 59-story office building	Restaurant	7,000	24
1	370 Park Avenue Basement space in Racquet and Tennis Club	Space used by commercial tenant	3,000	NA
		Locker room	4,200	NA
		Space used by commercial tenant	1,600	NA
1	390 Park Avenue Basement space in Lever House, a 21-story office building	Parking garage (200 spaces)	NA	10
		Unknown use	1,600	NA
1	400 Park Avenue Basement space in 21-story office building	Storage space for retail store	5,000	NA
1	410 Park Avenue Basement space in 21-story office building	Elevator machine room	2,000	NA
2	335 Madison Avenue Retail space in 26-story office building	Retail	10,000	34

Table 5-12 (Continued)

Potential Property Acquisitions Required and Potentially Displaced Businesses

Option 1 or 2	Address/Description of Affected Property	Business type	Estimated Occupied Sq. Ft. of Affected Business	Estimated Number of Employees
Queens				
1 or 2	3856-3864 43rd Street 2-story commercial building	Equipment Rental	18,500	60**
1 or 2	4305-4411 Barnett Avenue 20 1-story private garages	None	NA	0
1 or 2	4415 Barnett Avenue 1-story commercial building	Electrical Contractor	2,000	4
1 or 2	4425 Barnett Avenue 1-story commercial building	Sheet Metal Manufacturing	1,500	1*
		General Automotive Repair Service	1,500	2
1 or 2	4515 Barnett Avenue 1-story commercial building	Building Cleaning and Maintenance	3,000	100*
		General Automotive Repair Service	6,000	8
1 or 2	4701 Barnett Avenue 1-story commercial building	General Automotive Repair Service	3,000	4
1 or 2	4707 Barnett Avenue 1-story commercial building	Reupholstery and Furniture Repair	3,000	4*
1 or 2	4715 Barnett Avenue 1-story commercial building	Metal Manufacturing	3,000	2
Total Affected Employment				
	Option 1			285
	Option 2			285

Notes:

* Employment estimate by Claritas, Inc.; all other employment estimates by AKRF, Inc., in full-time equivalents.

** Refers to total employment in business affected including operations in adjacent building unaffected by property acquisition.

NA Not applicable. (No businesses and/or employees affected.)

Sources: Field survey by AKRF, Inc., fall 1999; Sanborn Maps; New York City Department of Finance; and Claritas, Inc.

Current office tenants are mostly small businesses, occupying approximately 2,500 square feet of space each. The estimated number of employees in the building is 39.

347 Madison Avenue. The Preferred Alternative would require the use of all, or a significant portion of, three ground-floor storefronts at 347 Madison Avenue for the installation of a pedestrian entrance to the new LIRR platforms (see Figure 5-2). Constructed in 1960 at the southeast corner of 45th Street and Madison Avenue, 347 Madison Avenue is a 20-story brick and stone building owned by MTA with approximately 230,000 square feet of office space with ground-floor retail space. Currently one retail storefront is vacant and two are occupied by an optical

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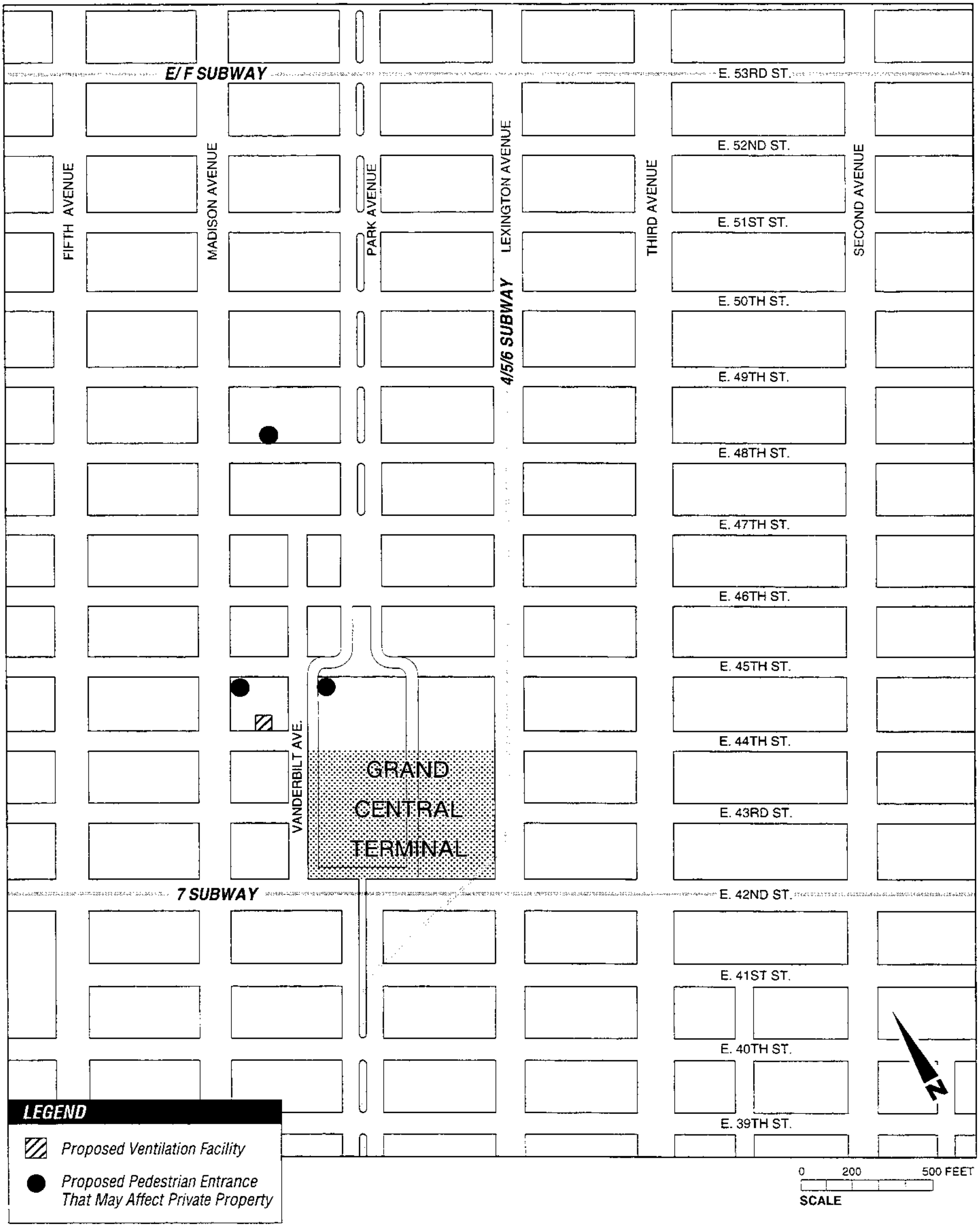

MTA / LIRR
East Side Access

Figure 5-2
Manhattan Areas of Potential Displacement

shop and a clothing/sporting goods store, respectively. Located at the southeast corner of Madison Avenue and 45th Street, Grand Central Optical occupies approximately 1,500 square feet and is estimated to employ five workers. Orvis, a retail clothing and sporting goods store, is located in the midblock on the south side of 45th Street. It occupies approximately 1,500 square feet and is estimated to employ approximately five people.

200 Park Avenue, Met Life Building. Constructed in 1963, 200 Park Avenue (the Met Life Building, formerly known as the Pan Am Building) is a 59-story office tower that spans Park Avenue just north of Grand Central Terminal. The Preferred Alternative would require use of a portion of the sidewalk at the southeast corner of Vanderbilt Avenue and 45th Street (see Figure 5-2), which is currently occupied by outdoor seating for Cafe Centro. Approximately half of the restaurant's outdoor seating would be required for the installation of a pedestrian entrance to the LIRR, located west of the restaurant's main entrance. However, Cafe Centro's principal seating area is an interior dining room of about 5,000 square feet. Due to the small portion of the restaurant's outdoor seating that would be acquired and its seasonal nature, together with all of the interior seating capacity that would remain intact, the cafe would not be substantially affected and would likely be able to remain in its current location.

245 Park Avenue. The Preferred Alternative would require use of part of the sidewalk adjacent to the building at 245 Park Avenue. This portion of the sidewalk is currently private property. No businesses would be displaced.

270 Park Avenue. The Preferred Alternative would require use of part of the sidewalk adjacent to the building at 270 Park Avenue. This portion of the sidewalk is currently private property. No businesses would be displaced.

280 Park Avenue. Constructed in 1962, 280 Park Avenue is a 28-story office tower that occupies the west side of Park Avenue between 48th and 49th Streets. Acquisition of a portion of the ground floor in 280 Park Avenue would be necessary for an additional LIRR pedestrian entrance associated with the Preferred Alternative. The area to be acquired is currently occupied by the Shinbashi Restaurant, and the acquisition would likely result in permanent displacement of the restaurant.

370, 390, 400, and 410 Park Avenue. Option 1 would require use of basement spaces at 370, 390, 400, and 410 Park Avenue during construction of the new LIRR tunnel approach to the GCT. After construction is complete, this space would be returned to the property owners. Specifically, effects on those buildings would be as follows:

- *Racquet and Tennis Club (370 Park Avenue):* In this building, Option 1's construction activities would require use of a lunchroom, storage space, and a bathroom currently used by a tenant, American Express; a locker room used by Racquet & Tennis Club members; and a third space currently used by a tenant, Bank of New York. These locations are currently used as support-type space only. It is assumed that these uses are nonessential to business operations, may be absorbed within the facility, and that the space will be reoccupied after construction is complete. Thus, the impacts of a construction period are not significant. Construction should take approximately two years to complete. After construction is complete, the basement space would be returned to the property owner.
- *Lever House (390 Park Avenue):* Construction activities associated with Option 1 would require use of the 200-space parking garage in the basement of that building and a 40-foot by 40-foot space. It is assumed that this location is currently used as support-type space only,

the use is nonessential to business operations, may be absorbed within the facility, and that the space will be reoccupied after construction is complete. Thus, the impacts of a construction period are not significant. The garage is currently operated by Kinney Parking, provides approximately 200 parking spaces and employs about 10 people. Business operation would be infeasible during the construction period. Construction should take approximately two years to complete. After construction is complete, the basement space would be returned to the property owner.

- *400 Park Avenue:* Option 1 would require the use of a 5,000-square-foot basement storage space used by a tenant, Syms clothing store. This area is currently used as support-type space only. It is assumed that this use is nonessential to business operations, may be absorbed within the facility, and that the space will be reoccupied after construction is complete. Thus, the impacts of a construction period are not significant. Construction should take approximately one year to complete. After construction is complete, the basement space would be returned to the property owner.
- *410 Park Avenue:* In 410 Park Avenue, a space currently used as an elevator machine room in a sub-basement would be used. Construction should take approximately one year to complete. After construction is complete, the basement space would be returned to the property owner.

Properties Affected Under Option 2. Option 2 would require acquisitions of different private properties than those discussed above for Option 1. Because this option's tunnels would be deeper as they approach GCT, the properties on the west side of Park Avenue between 52nd and 55th Streets would not be affected during construction. Option 2 would not affect the basements of 370, 390, 400, and 410 Park Avenue. Private properties that would be affected would be as follows.

47 East 44th Street. This property would be acquired under either Option 1 or Option 2. It is discussed above.

347 Madison Avenue. Option 2 would require use of the same space as Option 1, discussed above. This would affect the same three retail spaces in this building.

245 Park Avenue. Like Option 1, Option 2 would require use of privately owned sidewalk space in front of this office building. No businesses would be affected.

270 Park Avenue. Like Option 1, Option 2 would require use of privately owned sidewalk space in front of this office building. No businesses would be affected.

280 Park Avenue. Option 2 would displace the same restaurant space at 280 Park Avenue as Option 1, described above.

335 Madison Avenue. Option 2 would require use of space in the 26-story office building at 335 Madison Avenue between 43rd and 44th Streets. The space affected is at the corner of Madison Avenue and 44th Street and is currently occupied by Daffy's, a regional chain clothing retailer. Daffy's is located on both the ground and basement floors, occupies a total of 10,000 square feet, and is estimated to employ approximately 34 people at this location.

Potentially Affected Properties in Queens

3856-3864 43rd Street. Located on the west side of 43rd Street at 37th Avenue, 3856-3864 43rd Street is a 2-story brick building of approximately 18,500 square feet, on a lot of approximately 14,000 square feet (see Figure 5-3). The building, which contains six large loading bays on the first floor and offices on the second floor, is currently occupied by RPL Equipment Co., Inc., a contracting equipment sales, service, and rental company. The Preferred Alternative would need to use the space currently occupied by the southern third of this structure, and there could acquire either the southern third of the building or the entire structure. In addition to this property, RPL Equipment occupies about 9,000 square feet of an adjacent building that it constructed last year at 3650-3652 43rd Street, and employs a total of approximately 60 people. It is possible that if the southern portion of the structure is acquired, RPL Equipment might be able to remain in its current location. In this case, a handful of employees might be relocated or otherwise affected by the property acquisition. If the entire structure is acquired, RPL Equipment would be displaced from 3856-3864 43rd Street, and would have to find new space. It is assumed that the company might also choose to relocate its operations from the adjacent building at 3650-3652 43rd Street.

North Side of Barnett Avenue Between 43rd and 48th Streets. Buildings on the north side of Barnett Avenue between 43rd and 48th Streets might be required to facilitate construction work at Harold Interlocking. These properties include 20 1-story private residential car garages (4305-4411 Barnett Avenue), and several 1-story commercial buildings (4415, 4425, 4501, 4515, 4701, 4715-4719 Barnett Avenue), as follows:

- Twenty 1-story privately owned residential car garages located between 4305 and 4411 Barnett Avenue might be required during the construction of the Preferred Alternative. This would not affect any businesses. The garages could be replaced after the construction phase of the project.
- 4415 Barnett Avenue is a 1-story commercial building of approximately 2,000 square feet with an accessory parking lot, occupied by a licenced electrical contractor.
- 4425 Barnett Avenue is a 3,000-square-foot, 1-story building, occupied by State Duct Co., a sheet metal manufacturer and by Barnett Auto Repair auto repair shop.
- 4515 Barnett Avenue is an approximately 10,000-square-foot brick building with office space in the western portion of the structure and a 2-story-high bay and accessory parking area at the eastern portion. The office space is occupied by Amco Cleaning Corp., which employs approximately 100 people. Few of these employees are located at 4515 Barnett Avenue, since a majority work as contract office cleaners at off-site locations. An auto repair shop occupies the high-bay portion of the building, as well as the accessory lot, which is used for storage of damaged cars and salvaged parts.
- 4701 Barnett Avenue is a 1-story building of about 3,000 square feet, which is occupied by Magic Touch, Inc., a general automotive repair shop with a small accessory office.
- 4707 Barnett Avenue is a 1-story brick industrial building of about 3,000 square feet, occupied by Academy Cabinet Makers Wood, a furniture repair and re-upholstery business.
- 4715 Barnett Avenue is a high-bay 1-story brick manufacturing building of about 3,000 square feet, occupied by Barnett Iron Inc., a metal fabricating business.

Approximately 30 people are employed on the north side of Barnett Avenue between 43rd and 48th Streets, excluding an estimated 95 percent of Amco Cleaning Corp.'s employment.

Other Properties Affected in Queens. In addition to these properties, the Preferred Alternative would also require demolition of the structures as 2950-2970 Northern Boulevard near 41st Avenue, and several structures at Sunnyside Yard. The buildings on Northern Boulevard are currently owned by the Metropolitan Transportation Authority (MTA), so they would not need to be acquired for the MTA/LIRR East Side Access Project. The buildings in Sunnyside Yard are owned by Amtrak, which has been consulted during development of the proposed plans.

Potentially Affected Properties in the Bronx

In addition to the properties to be acquired in Manhattan and Queens, the Preferred Alternative would also require acquisition of a small parcel at Highbridge Yard. While the majority of Highbridge Yard is already owned by MTA, Metro-North Railroad would need to acquire a 69-square-foot triangular piece of property at the northern edge of Highbridge Yard, adjacent to Exterior Street. This property is currently vacant and owned by the City of New York.

Protection Under the Uniform Relocation Act

The rights of owners and tenants of real property acquired to implement the proposed project, including permanent easements, would be protected under the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, as amended (the Uniform Act). The Uniform Act provides for equitable treatment of persons displaced from their homes, businesses or farms by federal and federally assisted programs. It also establishes uniform and equitable land acquisition procedures. (Owner refers to either the fee owner of the property or the tenant-owner of improvements on it.) Entitlements for property owners under the law include the following:

- Just compensation for property, which may not be less than the acquiring agency's approved appraisal of the fair market value;
- Determination of just compensation by a court of law;
- The opportunity to accompany the appraiser who appraises their property;
- Written statement of, and summary of the basis for the amount established by the acquiring agency as just compensation;
- Payment of the agreed upon purchase price (or a deposit in the court) before being required to surrender possession of the property;
- Reimbursement for certain expenses incidental to transfer of title to the acquiring agency;
- Reimbursement for certain litigation expenses;
- At least 90 days' written notice to vacate occupied property;
- Relocation services and payments, where applicable; these may involve housing supplements, moving cost, etc. for residential acquisitions, or reestablishment, moving costs, etc. for business, nonprofit, or farm acquisitions; and
- Written statement or brochure advising property owners of their rights and entitlements, and assurance that they receive all of the services and payments to which they are entitled under federal and state law and regulations.

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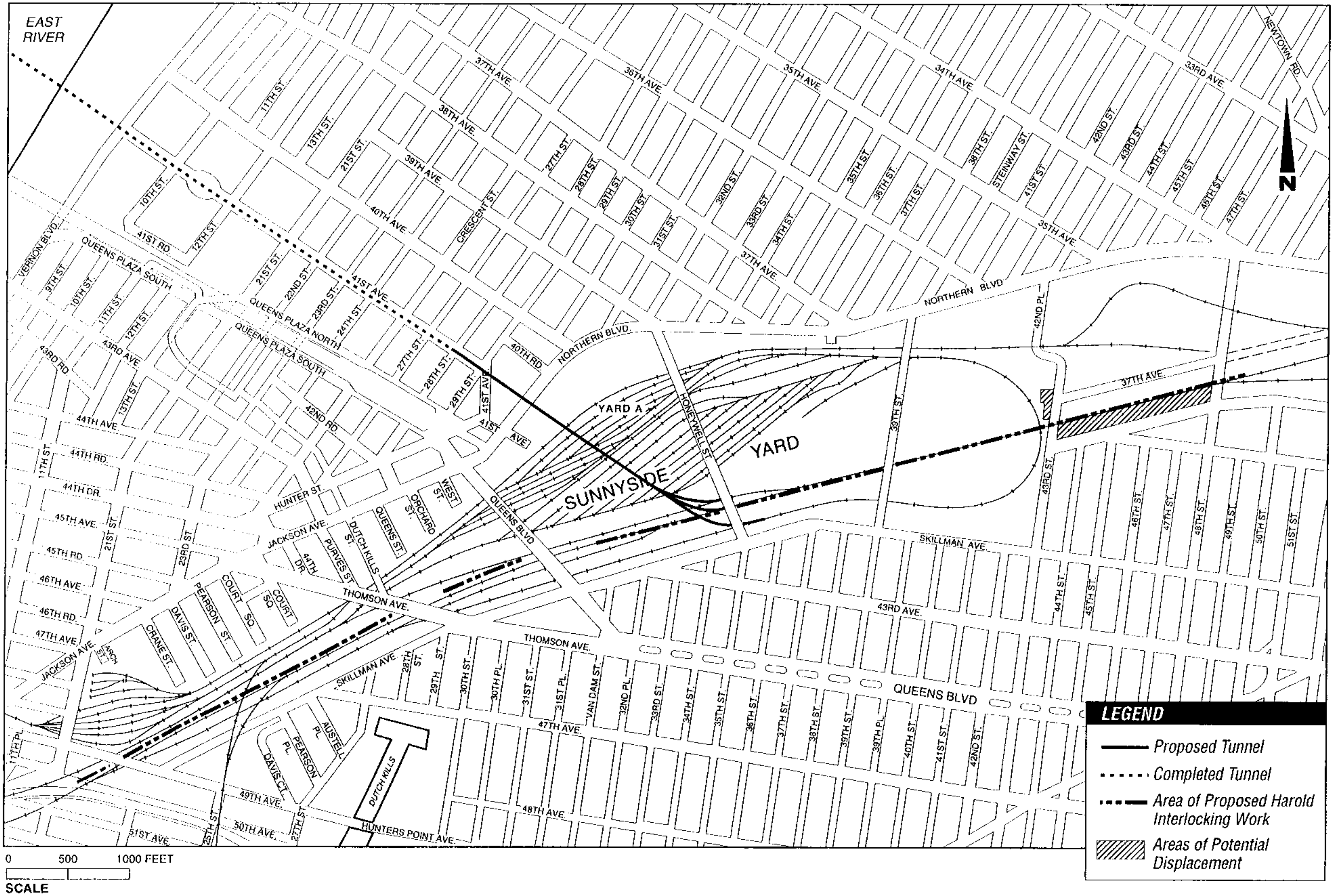

MTA / LIRR

East Side Access

Figure 5-3

Queens Areas of Potential Displacement

Relocation and Moving Expenses. In addition to the rights of owners, the Uniform Act provides entitlements to qualified businesses displaced as part of a federal and federally assisted program, including reimbursement for relocation expenses, including:*

- Payment for actual reasonable moving and related expenses for nonresidential moves, including transportation of personal property up to 50 miles, disconnecting, dismantling, removing, packing, crating, reassembling, and reinstalling relocated machinery, equipment, and other personal property, including connection to utilities available nearby; storage of the personal property for a period not to exceed 12 months; insurance for the replacement value of the personal property in connection with the move and necessary storage; any license, permit, or certification required of the displaced business at the replacement location; replacement value of property lost, stolen, or damaged in the process of moving; and professional services necessary for planning, moving and installing the relocated personal property at the replacement location.
- Actual direct loss of tangible personal property incurred as a result of moving or discontinuing the business based on the fair market value of the item for continued use at the displacement site, less the proceeds from its sale.
- Purchase of substitute personal property, if an item of personal property which is used as part of a business or farm operation is not moved but is promptly replaced with a substitute item that performs a comparable function at the replacement site.
- Payment for expenses required to search for a replacement location, not to exceed $1,000.
- Other moving-related expenses that are not listed as ineligible, as determined to be reasonable and necessary.

Re-establishment of Businesses. In addition to the above mentioned payments, a small business or nonprofit organization is entitled to receive a payment, not to exceed $10,000, for expenses actually incurred in relocating and reestablishing such small business or nonprofit organization at a replacement site, including:

- Repairs or improvements to the replacement real property as required by federal, state or local law, code or ordinance.
- Modifications to the replacement property to accommodate the business operation or make replacement structures suitable for conducting the business.
- Construction and installation costs, for exterior signing to advertise the business.
- Provision of utilities from right-of-way to improvements on the replacement site.
- Redecoration or replacement of soiled or worn surfaces at the replacement site, such as paint, paneling, or carpeting.
- Licenses, fees, and permits when not paid as part of moving expenses.
- Feasibility surveys, soil testing and marketing studies.
- Professional services in connection with the purchase or lease of a replacement site.

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* Source: 49 CFR Part 24, "Uniform Relocations Assistance and Real Property Acquisition for Federal and Federally Assisted Programs," posted on the internet by O.R. Colan Associates, Inc., at www.orcolan.com/row/uniform/main.html.

Fixed Payment for Moving Expenses. A displaced business may be eligible to choose a fixed payment in lieu of the payments for actual moving and related expenses, and actual reasonable reestablishment expenses as provided. Such fixed payment, except for payment to a nonprofit organization, shall equal the average annual net earnings of the business, as computed in accordance with the average annual net earnings of a business or farm operation as described in this section, but not less than $1,000 nor more than $20,000. The displaced business is eligible for the payment if it is determined, among other conditions, that the business cannot be relocated without a substantial loss of its existing patronage (clientele or net earnings). A business is assumed to meet this test unless it is determined that it will not suffer a substantial loss of its existing patronage.

Probable Impacts of Direct Displacement

As part of the procedure for preparing the acquisition stage relocation plan, all site occupants would be personally interviewed to determine their specific relocation needs, and would be furnished a copy of the state's informational booklet and fully informed of all benefits to which they may be entitled. Owners' properties that would be acquired for the Preferred Alternative, including properties used for Harold Interlocking improvements, a ventilation facility site, and any properties required for easements to allow new station entrances, would be compensated at fair market value and relocation benefits would be provided for displaced businesses. Businesses and tenants that would be displaced as a result of the Preferred Alternative would likely be able to relocate close to their existing locations with minimal disruption to business activity and minimal loss of employment.

Relocation Resources. It is anticipated that most of the displaced businesses would be successful in locating suitable alternative space. In evaluating the limited number of displaced tenants and the amount of space these tenants require, and comparing that with the large inventory of office, retail, warehouse, and industrial space in Manhattan and Queens, it is likely that suitable relocation opportunities would be available, despite the fluctuations of the marketplace and space availability. Though the condition of particular sectors of the real estate market at the time of construction cannot be predicted, market conditions are currently "tight" (i.e., new space is difficult to find), so it is conservatively assumed that this would remain true. If market conditions change, new space will become easier to find.

Restaurants are particularly sensitive to the effects of relocation, since their business is, in part, dependant on pedestrian traffic flows, as well as repeat clientele—both of which are highly sensitive to the location of business. A restaurant that relocates near its original location is more likely to retain its existing customer base. On the other hand, a restaurant that relocates far from the existing location enters a new market and must establish a new clientele. Given the sensitivity of restaurants to location, there would still be an opportunity for potentially displaced food service operations to relocate in the vicinity of Grand Central Terminal. According to information provided by Garrick-Aug Associates, a large commercial real estate brokerage firm, Midtown Manhattan contained an inventory of more than 1,500 retail stores with a vacancy rate of approximately 25 percent in mid-year 1999. It is anticipated that restaurants and fast food operations occupying 47 East 44th Street, 347 Madison Avenue, and 280 Park Avenue would relocate in the Grand Central Terminal area with no loss of employment.

Although vacancy rates for office space in Midtown Manhattan are currently very low, about 7.5* percent, it is likely that relocation opportunities would be available for firms located in 47 East 44th Street, because of the vast inventory of office space in Midtown Manhattan. Other relocation resources include downtown office buildings, where the vacancy rate is slightly higher at approximately 9.6* percent. Employers at 47 East 44th Street would likely be able to relocate in the vicinity of the existing location, retaining existing employees and resulting in no loss of employment.

The market for industrial space in Queens is currently fairly tight. For example, the vacancy rate for industrial properties ranging from 5,000 and 20,000 square feet, the smallest size units reported in an annual real estate survey by Greiner-Maltz Co. Inc., is 7.6 percent. Although this estimated vacancy rate is low, the number units in the inventory is high. Small size units make up the bulk of industrial properties in Queens, i.e., there are nearly 3,000 units between 5,000 and 20,000 square feet. Even with the low vacancy rate, there are currently about 228 properties available in Queens that could serve as a relocation resource for businesses displaced from Barnett Avenue by the proposed project. It is unlikely that the vacancy rate would decrease substantially by the time project construction begins, and thus, businesses displaced by the proposed project would very likely be able to relocate within Queens.

The other property displaced by the Preferred Alternative in Queens, RPL Equipment Company, currently occupies approximately 27,500 square feet in their two buildings. One of these would be affected by the project. According to the *Greiner-Maltz 2nd Quarter 1999 Industrial Market Review*, as of June 20, 1999 in industrial units between 20,000 and 29,999 square feet there were slightly more than 1 million square feet of available space, representing 9.3 percent of all inventory in this category. Due to the flexibility of industrial space, this business would be able to locate in a portion of a larger unit or in two smaller units next to each other, similar to its current configuration. RPL Equipment could therefore move to most units of more than 5,000 square feet, of which there were a total of 10.15 million square feet of available space at the end of June 1999, or 8.7 percent of the total inventory more than 122 million square feet.

SUBSURFACE EASEMENTS REQUIRED

In addition to the property acquisitions described earlier, the Preferred Alternative would also require acquisition of subsurface easements for the route of its tunnels in Manhattan. Specifically, easements would be purchased to allow the new tunnels to travel from the end of the existing 63rd Street Tunnel (at Second Avenue) westward to Park Avenue. Option 1 and Option 2 would have slightly different alignments in this portion of the route, and therefore would require different subsurface easements.

F. MITIGATION MEASURES

The project, overall, results in economic benefits. It would, however, require acquisition of private property. The rights of owners and tenants of real property acquired to implement the proposed project, including permanent easements, are protected under the Uniform Act. The Uniform Act provides for equitable treatment of persons displaced from their homes, businesses, or farms by federal and federally assisted programs. It also establishes uniform and equitable land acquisition procedures.

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* Source: Cushman & Wakefield Research Services, Market Report, New York New York, Mid-Year 1999.

Chapter 6: Visual and Aesthetic Considerations

A. INTRODUCTION AND METHODOLOGY

This chapter assesses the visible changes that would result from the East Side Access Project and considers the effect those changes would have on the areas nearby. Study areas for the assessment of visual considerations have been defined for the visible project elements of the TSM Alternative in Queens and for each of the six major Preferred Alternative project components: the Manhattan alignment, the Queens alignment and the four railroad yards—Blissville Yard, Maspeth Yard, and Fresh Pond Yard in Queens, and Highbridge Yard in the Bronx (study area maps are provided in each section of "Existing Conditions," below). The study areas correspond with project elements that are expected to be visible to the public from surrounding areas. As described below, the majority of the proposed work for the Manhattan alignment would be underground, though visible elements would include work within Grand Central Terminal (GCT), proposed off-street pedestrian entrances, and an above-ground ventilation facility. In Manhattan, the project's Options 1 and 2 are analyzed separately, since they would have different visual effects.

For the Queens alignment, proposed work would predominantly involve tunnel and track construction within existing active rail yards. However, proposed project elements, such as a new passenger station at Sunnyside, ventilation facilities, and Harold Interlocking work outside the Sunnyside yard area, would be visible to surrounding areas. Due to the nature of the work planned within the four replacement rail yards—Blissville, Maspeth, Fresh Pond, and Highbridge Yards—and the locations of the yards themselves, project elements are not expected to be visually prominent to the surrounding areas.

No study area was defined for Roosevelt Island for visual and aesthetic considerations because no visual change is anticipated. Proposed construction of the substation on Roosevelt Island would require subsurface work that, when completed, would not be significantly visible above ground.

The study areas are large enough to characterize the visual context of whatever element would be changing, but exclude areas where no visual impacts would be anticipated. The existing visual conditions and resources within each of the study areas are analyzed below, followed by a discussion of the impact of the project alternatives. The focus of the analysis is on those areas that are accessible to the public that could be affected visually by any of the alternatives, notably proposed work in GCT and project elements that would be visible to the surrounding area. Further detail is given below for each project location. Information for this analysis was collected through field visits to the TSM and Preferred Alternative study areas. Viewer groups in each area are identified and duration of views assessed to determine any potential impacts. Visual resources are considered from within the visual range of any visible project changes.

B. EXISTING CONDITIONS

MANHATTAN ELEMENTS

The locations where project elements would be visible for the Preferred Alternative include:

- GCT, Main Concourse level: Biltmore Room and either the existing unused ticket windows in the Main Concourse or the area of existing stores along the east side of the Shuttle Passageway (Preferred Alternative Option 1).
- GCT, Dining Concourse level: along the north wall in the areas of the entrances, tracks, and platforms at tracks 114 through 117, and in new public areas to be developed in Metro-North's Madison Yard, which is not currently visible to the public (Options 1 and 2).
- 47 East 44th Street (Options 1 and 2).
- The sites of the proposed new pedestrian entrances (Options 1 and 2).

These areas and their visual context are described below (see Figure 6-1). There would be no visible TSM elements in Manhattan.

GRAND CENTRAL TERMINAL

Affected Areas

The Biltmore Room is located in the northwest quadrant of the terminal and connected to the Main Concourse by a marble passageway, the Biltmore Concourse. It is a large, square space with glossy marble walls and a high ceiling with classical moldings. The center of the room is currently occupied by a large, modern newsstand, utilitarian in appearance. In the Main Concourse, the mostly unused ticketing windows in the east half of the south wall are similar in appearance to the ticketing windows in the west half, which are used by Metro-North Railroad (MNR). Both the east and west windows are a series of rectangular openings filled with decorative, scrolled brass grilles set in long marble booths.

The existing stores adjacent to the Shuttle Passageway are recently installed, glass-fronted retail spaces, including a bookstore.

On the Dining Concourse level, the entrances to tracks 114 through 117 extend along the Dining Concourse's north wall. Decorative arched stone plaques are located above each entrance, which are also framed by smaller, rectangular train information displays. There are also decorative brass grilles set high in the wall. The area of tracks 114 through 117 consists of parallel sets of depressed railroad tracks separated by plain concrete platforms. This area is at a lower grade than the public spaces of the Dining Concourse level and is accessed by steel and concrete staircases at each entrance.

Visual Context

GCT is a landmark of extraordinary grandeur. Its public interior spaces, the Main and Dining Concourses, are grand, marble-clad rooms with connecting vaulted passageways. These interior spaces, equaling the terminal's monumental limestone facade in terms of elegant design and beauty, are also inspiring visual resources. The Main Concourse's barrel-vaulted veiling, rising 120 feet, is decorated with illuminated constellations, which have recently been cleaned and restored as part of a major renovation and restoration of the terminal's interior. Also as part of this renovation, a planned, though previously unbuilt, grand marble staircase has been erected on the east side of the Main Concourse to match the one on the west side. The north wall of the Main Concourse is lined with the arched open entrances to MNR tracks and platforms. The southern wall is occupied by a series of marble ticket booths with long, modern train display destination boards above them. The ticket booths are divided by the wide passage extending to Vanderbilt Hall and 42nd Street.

New retail spaces designed with glass and metal grille storefronts have been constructed on the Main Concourse level. These are located along the passages extending from the Main Concourse, including the Lexington Passage that extends east from the Main Concourse and near the Shuttle Passageway, to the west of the Main Concourse.

The Biltmore Room is visible only from the immediate areas surrounding it, such as the Biltmore Concourse and the 45th Street Roosevelt Passage, as it is located at the edge of the terminal. The east ticketing windows are visible from within the Main Concourse and for a short distance on the Lexington Passage.

The new stores are visible from the Shuttle Passageway, which extends to the north and south, just west of the Main Concourse. The Shuttle Passageway has marble walls with high ceilings and splits into two parallel passageways as it extends south. The east passage is at the same level as the rest of the Main Concourse and leads to the subway. The passage to the west is a ramp that gradually ascends to the wood and glass-fronted entrance doors leading out to East 42nd Street.

The large, central Dining Concourse area is a large marble room with passageways that extend east and west from it. This concourse has also been modernized with new restaurant spaces and seating areas throughout. In the immediate vicinity of the entrances to tracks 114 and 117, modern new restaurant spaces are cut into the west walls of the concourse. Two escalators are also located along this wall between the restaurant areas. This area is located to the far west of the Dining Concourse level behind the grand marble stairs that extend from the Main Concourse, isolating this area from views from the majority of the Dining Concourse. The tracks and platforms are only visible from the entrances to the tracks and the immediate vicinity around the entrances.

OTHER AREAS IN MANHATTAN

Affected Areas

47 East 44th Street. This 5-story, buff-colored brick building occupies a small lot on the north side of the street between Vanderbilt and Madison Avenues (see view 1 of Figure 6-2). This simply designed structure, dating from the late 19th century, consists of a plainly articulated facade with ornament limited to simple geometric brick detailing. Large unadorned window openings are set shallowly into the facade above a modern glazed coffee shop at street level.

New Entrance Sites. The sites for new pedestrian access to GCT would be located at the buildings discussed below, for a total of five new entrances for each project option:

- 200 Park Avenue (the Metropolitan Life Building) is a tall, 58-story glass and concrete tower that straddles Park Avenue. It is oriented east-west, set on a wide 10-story base, and contiguous with GCT to the south. A triple-story arcade surrounds the building's lower glass-fronted 3 stories (see view 2 of Figure 6-2). A restaurant with a modern glazed storefront surmounted by a red canopy, surrounded by an outdoor sidewalk cafe with tables and chairs, is at the northwest corner of the building (Option 1).

- 270 Park Avenue (the Chase Building) is a prominent glass curtain-wall building with a 52-story tower on Park Avenue and a 12-story annex along Madison Avenue that occupies the entire block bounded by Park and Madison Avenues, between East 47th and 48th Streets. The Park Avenue tower is set in a wide open plaza (see view 3 of Figure 6-3). An arcade of square columns encircles the base of the tower, supporting its cantilever above street level. A newly constructed, small glass and metal shelter housing the MNR entrance to GCT is located adjacent to the building on the north side of East 47th Street. On East 48th Street, a low, narrow stone planter containing small trees and shrubs divides the plaza from the sidewalk (Options 1 and 2).
- 280 Park Avenue is located on the north side of East 48th Street across from 270 Park Avenue. This 28-story glass-and-metal sheathed modern structure fronts onto Park Avenue, with an adjoining 42-story tower behind it (see view 4 of Figure 6-3). There is a shallow paved plaza in front of a portion of the building on East 48th Street that is currently occupied by several square and rectangular stone planters containing small shrubs and trees (Options 1 and 2).
- 245 Park Avenue occupies the entire block between Park and Lexington Avenues between East 46th and 47th Streets (see view 5 of Figure 6-4). It is a 45-story, modern, glass and metal framed structure with a square-columned arcade that surrounds the structure at street level, set on a shallow paved plaza (Options 1 and 2).
- 347 Madison Avenue is a stone and brick clad building that occupies the southeast corner of Madison Avenue and East 45th Street (see view 6 of Figure 6-4). This building has a predominantly unornamented 4-story limestone base surmounted by 16 stories clad in buff-colored brick with limestone and terra cotta trim. There are ground-floor retail spaces located along East 45th Street. The retail space occupied by Grand Central Opticals is at the corner with Madison Avenue and is a simple glazed storefront of a plain design (Options 1 and 2).
- 335 Madison Avenue occupies the entire block between Madison and Vanderbilt Avenues between East 43rd and 44th Streets. The Bank of America building is a 26-story glass, metal and stone clad structure with stores located at street level (see view 7 of Figure 6-5). The northwest corner of the building at Madison Avenue and East 44th Street is occupied by a retail space with large plate glass and metal display windows set between stone sheathed piers (Option 2).

Visual Context

The area within visual range of the Manhattan project sites is roughly bounded by Lexington Avenue to the east, Madison Avenue to the west, East 48th Street to the north, and East 42nd Street to the south. This is an extremely dense urban center characterized by tall buildings from all periods beginning in the early 20th century and by substantial traffic and pedestrian activity. Between these two avenues, GCT, the Metropolitan Life Building, and the Helmsley Building together form a massive island, interrupting the north-south and east-west flow of traffic and people on Park Avenue and on East 43rd and 44th Streets. Park Avenue traffic uses a viaduct, built at the time of GCT, which winds its way through and around the three large structures and crosses East 42nd Street. Alongside and partially beneath the viaduct is Vanderbilt Avenue, a relatively narrow road that runs from East 42nd Street to East 47th Street.

In most locations, the area's streetscape is dominated by the masonry or steel and glass streetwalls of Manhattan's buildings and skyscrapers, which generally limit visibility of any individual feature beyond the blocks on which it is located. The exception is Park Avenue, which offers a north-south vista that includes all its sidewalks, roadways and median, building plazas, and a variety of office buildings, all focusing at its southern end on the Helmsley Building, with its grand pyramidal roof capped by an ornate cupola silhouetted against the 58-story, concrete, steel, and glass 1960's Metropolitan Life Building. In the area, there are also two small, newly constructed steel and glass shelters that house the Metro-North entrances to GCT. One is located at the corner of Madison Avenue and East 47th Street and the other at the corner of Park Avenue and East 48th Street.

QUEENS ELEMENTS

The locations where project elements for the TSM Alternative would be visible include:

- Hunters Point Avenue bridge in Hunters Point.
- Proposed route of the pedestrian walkway along Borden Avenue between the Long Island City LIRR station and East River ferry terminal in Long Island City.
- East River ferry terminal in Long Island City.
- Long Island Expressway (LIE).

The locations where project elements for the Preferred Alternative would be visible include:

- The yards: the complex of railroad activities at Yard A, Sunnyside Yard, the LIRR right-of-way, and Harold Interlocking.
- The buildings at 2950-2970 Northern Boulevard near 41st Avenue.
- Queens Boulevard bridge, near Skillman Avenue.
- Intersection of 43rd Street and the LIRR bridges (northwest corner).
- Area between 43rd Street to 48th Streets, bounded by 37th and Barnett Avenues.

All of these areas and their visual context are described below (see Figures 2-1 and 2-2 of Chapter 2, "Project Alternatives" for locations of the TSM elements and Figure 6-6 for locations of the Preferred Alternative Queens alignment elements).

TSM ELEMENTS

Affected Areas

Hunters Point Avenue Bridge. The Hunters Point Avenue bridge is the narrowest of the viaduct bridges that cross the yards and is located at the western end of the rail yard complex. It carries two-way traffic and is four lanes wide. It is bordered by concrete sidewalks with chain-link fencing along the west side of the bridge and combined fencing of approximately 4 foot high concrete walls topped by chain-link fencing along the east side. Access to the Hunters Point LIRR station is located from the bridge via covered stairs that descend from either side of the bridge to the train platform below.

Proposed Route of the Pedestrian Walkway. This encompasses the sidewalk on the south side of Borden Avenue east of the present Long Island City LIRR station to 2nd Street, and the parking lot of the East River ferry terminal. The sidewalk is approximately 15 feet wide, and is divided from the LIRR's property by a metal chain-link fence. There are standard metal street lamps, parking meters, and short, round, concrete bollards placed at even intervals along the edge of the sidewalk with the street. The parking lot of the ferry terminal is a flat, unlandscaped, at-grade paved surface with street lamps around its perimeter.

East River Ferry Terminal Slip. The New York Waterway slip extends for a short distance into the water and is constructed of wooden piles with a concrete walkway. A rubber bumper is attached to the edge of the slip where the boats dock.

Long Island Expressway. The Long Island Expressway (LIE) is a prominently visible, major transportation spine that extends through Queens. The proposed location of the flyover ramp near the 74th Street underpass is on the expressway's elevated roadbed that crosses a deep ravine containing the New York Connecting Railroad freight line tracks on a concrete bridge. The expressway gradually becomes elevated east of 74th Street, supported by concrete retaining walls, with the bridge supported on piers on either side of the trackbed. The one-lane wide north collector/distributor roadway runs parallel to the highway at the same elevation and on the same bridge, and is separated from the highway by a standard concrete Jersey barrier. There are tall pole-mounted lights at even intervals along the roadbed and chain-link fencing located on either side of the bridge where it crosses the railroad tracks.

The area of the proposed new eastbound entrance ramp, east of Queens Boulevard, encompasses the LIE service road, the eastbound portion of the LIE, and the embankment between the two roads. The service road carries one-way traffic and is three lane wide. It is at a lower elevation than the roadbed of the LIE, which runs parallel to it. The eastbound portion of the LIE is three lanes wide and separated from the westbound portion by low metal guard rails or concrete Jersey barriers. There are tall pole mounted lights along the highway, and large signs on metal grid structures mounted above the highway and on the embankment between the highway and service road. A low concrete retaining wall runs between the expressway and the embankment, which is approximately 20 feet wide and planted with small shrubs and trees.

Visual Context

Hunters Point Avenue Bridge. The area east and west of the bridge consists of the depressed railroad tracks of the rail yard complex, covered concrete platform of the Hunterspoint Avenue LIRR station that extends east and west of bridge at grade with the train tracks, and the No. 7 subway tracks. At the north end of the bridge, stairs lead down into the below-grade subway station from the east side of the bridge. The bridge is visible north on Hunters Point Avenue and the immediately surrounding commercial and light industrial buildings that line the avenue. The bridge can also be seen at the dead end of Skillman Avenue at Hunters Point Avenue, where a paved parking lot and plain brick commercial buildings are located.

Proposed Route of the Pedestrian Walkway and Ferry Slip. The area within visual range of the proposed walkway and ferry slip is composed of a commercial/light manufacturing district and the LIRR station and surrounding rail yard. Borden Avenue is a two-way street, with views blocked from the west by a large, modern, approximately 6-story brick ventilation structure located in the middle of Borden Avenue just east of 5th Street. East of this structure, the north side of Borden Avenue is lined with typically plain, two-story brick commercial structures, including a restaurant. The south side of the street is occupied by the railroad's property, including the at-grade LIRR tracks and the LIRR's supply and service depot at the southeast corner with 2nd Street, where small metal and brick structures and construction materials are located. 2nd Street is a narrower two-way street lined with a variety of structures that differ in visual appearance, including a large brick power plant with tall smoke stacks dating from the early 20th century, and a small stone building with a peaked roof dating from the late 19th century. Several structures are located in and around the ferry parking lot, including modern metal shed-like structures, a Con Edison substation and massive eight-silo concrete storage terminal, and older early 20th century brick structures. The shoreline at and around the ferry slip consists of a dirt and rubble embankment, with what appears to be the remnants of an old pier nearby.

Long Island Expressway. In the vicinity of the proposed LIE flyover ramp, the expressway is elevated as it passes primarily a warehouse district to the north and a residential district to the south. The north and south collector/distributor roads run parallel to the expressway, receding below highway grade and connecting to 74th Street, which passes beneath the expressway, via concrete ramps. As described above, railroad tracks run north-south in a deep cut east of 75th Street. Two service roads parallel the expressway, at grade with the rest of the surrounding area. North of the LIE, a small block of short, detached and attached brick houses occupies the north side of the LIE service road between 74th and 73rd Streets. East of 74th Street, several plain, one and two-story warehouses occupy the land along the north side of the service road. Views of the LIE roadbed are blocked from these areas by the tall north retaining wall of the expressway. Along the south side of the LIE, several three and four-story attached homes and apartment houses line the south side of the service road. Views at street level of the LIE roadbed are blocked by the expressway's approximately 20 to 25 foot concrete retaining wall, except between 74th and 75th Streets, where the south service road inclines to highway grade and partial views of the expressway are provided above the concrete retaining wall through chain-link fencing.

The area surrounding the proposed location of the LIE entrance ramp consists primarily of a residential area of tall brick apartment complexes to the north and a large paved parking area to the south. At this location, the LIE is elevated as it passes through the area and views of the expressway from the at-grade street level areas to the north are blocked by the expressway's concrete retaining walls and solid impermeable fencing extending along the north side of the LIE. Views are provided of the service road and the LIE from the large at-grade parking lot to the south, as only a grassy strip with a sidewalk divides this area from the service road.

PREFERRED ALTERNATIVE, THE YARDS: YARD A, SUNNYSIDE YARD, AND THE AMTRAK/LIRR TRACKS

Affected Areas

Yard A, Sunnyside Yard, and the Amtrak and LIRR Main Line and Port Washington Branch tracks ("the yards") appear as one vast area of railroad tracks interspersed with electrical facilities, poles, and wires; and 1- to 3-story early 20th century masonry buildings and modern metal structures and trailers, utilitarian in appearance (see Figure 6-7). This whole area is depressed below the surrounding land. Vegetation is sparse, mostly consisting of short trees and lightly overgrown grassy areas in isolated locations, with the exception of the southern edge, which is bordered by taller and much denser vegetation. There are freight cars stored on the tracks, with Amtrak and LIRR trains moving on the two separate sets of tracks on an embankment that extends east-west along the southern end of this area (see Figures 6-8 and 6-9). The railroad tracks taper to a narrow point at the western end; at the Hunters Point Avenue bridge, the Hunterspoint

Avenue LIRR station is visible. The station consists of concrete platforms accessed from covered stairs at the bridge.

Visual Context

The visual character of the area surrounding the yards is that of an industrial district consisting of a variety of early and mid-20th century manufacturing and warehouse buildings. The location of the yards below the surrounding land, as well as the densely built-up character of the surrounding area, almost completely isolate the yards from view from the surrounding neighborhoods. To the north, views of the yards are blocked by a barrier of 2- to 8-story brick warehouse buildings that line the south side of Northern Boulevard and abut the yards (see view 3 of Figure 6-8). Views of the yards are available through chain-link fencing at the foot of a few streets that extend south from Northern Boulevard and dead-end at the yards. To the east, shorter buildings along 43rd Street and 42nd Place also create a similar streetwall that obstructs views. These structures are typically 2-story, plain commercial buildings dating from the 1960's and 1980's with loading docks at street level.

To the south, Skillman Avenue, a one- and two-way road depending on location, parallels the entire southern length of the yards (see view 6 of Figure 6-10). There are no buildings between this street and the yards, but fencing between the northern edge of the road and the yards obscures views down into them, except in some locations where fencing is broken or missing (see view 7 of Figure 6-10). Fencing along the yard east of the Queens Boulevard bridge is approximately 8 feet high, of densely woven metal that appears to have been recently installed and effectively blocks views. West of the bridge, the edge of the yards is less well maintained with older metal pole and chain-link fencing. Along this portion, heavy vegetation also blocks views in places where the fence is dilapidated. In areas where there are opportunities to see into the yards, pedestrians and workers in the commercial and industrial buildings across the street have limited, sporadic views in the immediate areas of the openings.

At the western point of the yards, the steel and concrete LIE bridge crosses north-south and blocks views of the yards from the west. Five other bridges span the yards at relatively even intervals. These bridges typically carry two-way traffic and have narrow concrete sidewalks with mostly a variety of impermeable metal or concrete siding that obstructs views. In the few locations where there is chain-link fencing, the yards can be partially seen through the fencing, providing, at most, short, passing views into the yards. The yards are not visible to the general public on the Honeywell Street bridge, as it is currently closed and in a poor state of repair (see view 8 of Figure 6-11). However, the portion of the bridge near Northern Boulevard is open to authorized traffic traveling from Northern Boulevard to a driveway that descends from the bridge into Sunnyside Yard. The yards are also visible from the passing subway trains on the upper deck of the Queens Boulevard bridge, which spans the yards at roughly midpoint and from a few locations on its lower vehicular deck, described below (see view 9 of Figure 6-11). In addition, the yards can be seen in passing by passengers traveling on the Amtrak and LIRR trains that run adjacent to the yards.

OTHER PREFERRED ALTERNATIVE QUEENS ELEMENTS

Affected Areas

2950-2970 Northern Boulevard. These three 1- and 3-story manufacturing and warehouse buildings, dating from the 1920's (and now owned by MTA), have an abandoned appearance, with peeling paint as well as graffiti on the facades of the buildings at street level (see view 10 of Figure 6-12). These structures are separated by narrow parking lots that are fenced off from Northern Boulevard.

Queens Boulevard Bridge. The bridge spans the yards (Yard A, Sunnyside Yard, and the LIRR Main Line and Port Washington Branch tracks) at midpoint and is a prominent, heavily traveled thoroughfare (see view 9 of Figure 6-11). This metal bridge consists of a lower vehicular deck, four lanes wide, with narrow sidewalks on either side, and an upper deck on which the subway trains run, blocking light to the vehicular deck. A two to three-story metal boxy structure with small windows is attached to and just east of the bridge at Skillman Avenue. The yards are visible from a few locations on the vehicular deck to passing pedestrians, through small sections of chain-link fencing interspersed between larger sections of tall metal panels, and from a set of employee service stairs on the east side of the bridge that lead down to Sunnyside Yard.

Intersection of 43rd Street and LIRR Bridges. At the northwest corner of this intersection there is a long, 2-story commercial structure (see view 11 of Figure 6-12). Erected during the 1980's, it has a flat roof and no ornament, with loading docks located at street level.

Area between 43rd and 48th Streets. The two parallel group of tracks that compose the Amtrak and LIRR Main Line and Port Washington tracks cross 43rd and 48th Streets on two separate steel and concrete bridges. Between these streets, and bounded by 37th Avenue to the north and Barnett Avenue to the south, the tracks run on a narrow, raised embankment that is at the same elevation as the bridges (see view 12 of Figure 6-13). Tall metal poles and high-tension towers support electric wires that extend along the length of the tracks. The slopes of the embankment are covered in light vegetation and small trees.

Between the train embankment and the north side of Barnett Avenue, a group of attached 1-story private residential garages and several 1-story, brick, boxy, commercial buildings line the street (see view 13 of Figure 6-13). The 20 small garages, which are located on a slight incline commencing at the corner with 43rd Street, are plainly designed short structures with flat roofs. Along the Barnett Avenue side, they consist simply of wooden garage doors set in plain brick framing. Eastward, the remaining portion of this street to 48th Street is occupied by a variety of flat-roofed brick and concrete structures interspersed with small, chain-link, fenced-off parking areas. These structures appear to have been built during the 1960's, some with small windows and with roll-down corrugated metal gates.

Visual Context

2950-2970 Northern Boulevard. In visual range of this site Northern Boulevard is a wide thoroughfare that carries two-way traffic. However, the steel truss viaduct of the elevated subway tracks that extends above Northern Boulevard, which blocks light to the street, severely restricts views of the site to only the immediately surrounding area (see view 10 of Figure 6-12). Along the south side of the street, contiguous with the project site, there are other brick commercial and parking structures, utilitarian in appearance. Directly across Northern Boulevard is the large staging site of MTA New York City Transit's (NYCT) 63rd Street Connector project. This site, blocked off from the street by tall wooden construction barriers, occupies almost the entire block between 41st Avenue and 40th Road. At the entrance to the construction site, views are available of a large dirt area, an enormous hole in the ground, and mounds of dirt surrounding it. Views to the project site are blocked from Queens Plaza by the heavy framework of the elevated train structure.

Queens Boulevard Bridge. The area surrounding the Queens Boulevard bridge consists primarily of the large expanse of the railroad yards it crosses, which extend east and west from the bridge and are described above. The bridge is also visible in the immediate vicinity of its northern terminus at Northern Boulevard, which is lined by brick commercial and warehouse buildings, and from the congested, heavily traveled Queens Plaza approach to the bridge across Northern Boulevard. On Skillman Avenue, the bridge is visible for longer distances east and west on Skillman Avenue, as there are no buildings between the north side of this street and the railroad yards that block views of the bridge (see view 6 of Figure 6-10).

Intersection of 43rd Street and the LIRR Bridges. The area surrounding the project site at the corner of 43rd Street and the LIRR bridge is defined by plain brick commercial buildings, parking lots, and small vacant areas (see view 14 of Figure 6-14). A winding road that carries two-way traffic with cars parked along its paved and unpaved shoulders, 43rd Street turns into 42nd Place at Northern Boulevard. Due to the sharp curves in the road, the site is only visible to the immediately surrounding areas.

Area between 43rd and 48th Streets. The areas within visual range of the LIRR bridges and embankment differ significantly to the north and south. A two-way street, 37th Avenue is predominantly industrial, with little pedestrian traffic (see view 12 of Figure 6-13). The south side of this street, contiguous with the railroad embankment, consists primarily of a vacant, cracked, paved area overgrown with small weeds. There are also several plain 1-story brick and concrete commercial buildings that line the street near 48th Street. A few 1- and 2-story plain structures also occupy the northern street frontage (one of which has been converted for use as a church) with some vacant fenced-off lots. There is also a large, striking, newly constructed concrete and metal structure with large Korean symbols and lettering reading "New York Presbyterian Church" affixed along the west facade of the structure. The railroad embankment is clearly visible along 37th Avenue, where there are no buildings along its south side—including from the two church buildings opposite this area. It is also visible from 43rd Street, described above, within visual proximity of the embankment.

In contrast, the area south of Barnett Avenue is composed of a leafy, tree-lined neighborhood that has a suburban character and is a visual resource (and historic district). Lining the south side of Barnett Avenue and the streets south of it are 2- and 3-story brick houses and taller brick apartment buildings that date from the 1920's and 1930's (see view 15 of Figure 6-14). Views of the railroad embankment from the south side of Barnett Avenue and the streets that dead-end onto it are mostly obstructed by the 1-story garages and commercial buildings on the north side of the street. However, where there are gaps between the buildings in the area of the small parking lots, described above, the train embankment and passing trains are visible.

BLISSVILLE YARD, QUEENS

AFFECTED AREA

Blissville Yard is a swath of predominantly unused railroad property located near Newtown Creek (see Figure 6-15 and view 1 of Figure 6-16). The tracks are in poor condition and some are missing their wooden ties. They are overgrown with and surrounded by unkempt vegetation, small trees, and refuse. Along the northern edge of the yard, the railroad tracks of the LIRR Montauk Branch run on an embankment supported by a concrete retaining wall. An additional Montauk Branch track, which appears to be the only at-grade track in use in the yard, runs along the embankment and is set in a maintained gravel bed.

VISUAL CONTEXT

The area within visual range of the yard is composed of industrial and commercial districts. To the south, a narrow, winding, paved service road leading to industrial buildings extends along the edge of the yard at the same grade (see view 2 of Figure 6-16). Since there is no fencing between the road and the yard, the yard is clearly visible along this street to the series of industrial properties opposite the yard, set behind chain-link and barbed wire fences. There are utilitarian warehouse-type buildings, large cylindrical gas tanks and associated above-ground gas pipes, and lumber and gravel piles. From this street, traveled by heavy trucks going to and from the industrial properties, portions of the opposite industrial shoreline of Newtown Creek are visible.

The north side of the yard is bordered by a variety of 1- and 3-story brick and concrete nondescript commercial buildings that line the north and south sides of Review Avenue, a busy, heavily traveled commercial street (see view 1 of Figure 6-16 and view 3 of Figure 6-17). The structures along the south side of the street abut the yard and form a streetwall that completely obstructs views into the yard, except where there are breaks between the buildings, such as a vacant lot, driveway, or parking lot. However, the blocks between Review Avenue and the yard are deep, and, therefore, the yard is only visible from a distance, typically behind chain-link gates or vegetation (see view 4 of Figure 6-17).

To the west of Blissville Yard, the at-grade tracks of the LIRR Montauk Branch continues across a metal truss bridge that spans Dutch Kills. The tracks on the embankment drop down to grade and veer to the north across another railroad bridge spanning Dutch Kills. The yard is not visible from the Borden Avenue bridge, which crosses Dutch Kills northwest of the yard, or to areas farther west across Dutch Kills.

East of the yard, one set of LIRR tracks continues at-grade across a narrow service road that is an extension of Van Dam Street, south of Review Avenue. The service road descends from Review Avenue, which in this location is at a higher elevation than the yard. It terminates at a paved parking lot that is located under the metal and concrete JJ Byrne Memorial Bridge (Greenpoint Avenue), which spans the yard, industrial properties, and Newtown Creek. The four-lane bridge, bordered on either side by narrow sidewalks and chain-link fencing, offers viewers on the bridge—vehicular traffic and pedestrians—views, through the fencing, of the yard and industrial shorelines of Newtown Creek to the west (see view 5 of Figure 6-18).

MASPETH YARD, QUEENS

AFFECTED AREA

Maspeth Yard consists of a long, flat, relatively narrow strip of land containing at-grade railroad tracks (see Figure 6-19 and view 1 of Figure 6-20). The active rail lines of the LIRR Montauk Branch run along the eastern edge of the yard paralleling the curve of Rust Street. Additional railroad tracks are located to the west of the LIRR tracks in unpaved areas surrounded by grass and light vegetation. There are also piles of construction materials, construction debris, such as broken-up rocks and concrete, and railroad cars stored in the yard. Tall wooden utility poles with wires extend along the length of the yard down its center.

VISUAL CONTEXT

Maspeth Yard is surrounded by a commercial and industrial area with the exception of a small residential district to the east. From the west, the yard is not visible, since structures along its border block any views. The western edge of the yard is lined with 1- to 4-story concrete and brick nondescript factory and warehouse-type buildings, some of which appear to be vacant (see view 1 of Figure 6-20). These structures, interspersed with parking lots and grassy unbuilt land parcels, effectively block views to the yard from areas to the west.

The east side of the yard is bordered by Rust Street, a wide, four-lane road that is heavily trafficked. From Rust Street and properties across the road, the yard is clearly visible. The east side of the street, opposite the yard, is lined predominantly with 1- and 2-story brick and concrete warehouse buildings (see view 2 of Figure 6-20). South of Maspeth Avenue, however, a small residential area abuts Rust Street. Properties on the east side of the street include a three-story house at Maspeth Avenue and a church and parish house on a sloping wooded block between 57th Road and 57th Drive (see view 3 of Figure 6-21). Along most of Rust Street, the yard is bordered by a chain-link fence that is periodically obscured by unmaintained small trees and bushes along the street that in turn block views into the yard. Where there is no fencing, including gaps and the at-grade railroad crossings at Maspeth Avenue and 49th Street, the yard is clearly visible to passing vehicular and pedestrian traffic (see view 4 of Figure 6-21). The yard can be seen from the residential structure on Rust Street Between Maspeth Avenue and 57th Place, described above, and for a short distance, within a block of the yard, on the north side of 57th Road, where ten small attached and detached houses are located, and on the south side of 57th Drive, where 13 small, 2-story attached rowhouses are located. The yard is also fully visible to passersby who cross it on Maspeth Avenue, a heavily trafficked road that crosses the yard and Montauk Branch tracks at grade, and at the 49th Street railroad crossing. Railroad crossing barriers and bells warn vehicles of oncoming trains.

FRESH POND YARD, QUEENS

AFFECTED AREA

Fresh Pond Yard consists of a depressed triangular area formed by three sets of railroad tracks, as well as an additional length of tracks to the west (see Figure 6-22). Where the yard can be seen, it consists of at-grade railroad tracks, separated by paved sections (see view 1 of Figure 6-23). Tall wooden utility poles with associated utility wires extend along the paved portions. Freight rail cars are also stored along the tracks. A steel truss railroad bridge is also visible in the triangular portion of the yard near Mafera Park.

VISUAL CONTEXT

Fresh Pond Yard is visible from very few locations in the surrounding area. Much of the yard is bordered by industrial and commercial buildings. The yard is also bordered by a large cemetery, a park, and residential neighborhoods. Lutheran Cemetery, a large fenced-in landscaped area on a hill, completely blocks views from the northeast. A modern retail shopping mall is located west and adjacent to the cemetery, and fronts onto Metropolitan Avenue, blocking views from the avenue. Along Admiral Avenue, approximately 45 attached 2-story frame rowhouses create a streetwall along the street's southern side. At the dead-end of the street, however, the tops of railroad cars in the yard are partially visible above dense fencing that runs along the northern edge of the yard (see view 2 of Figure 6-23). South and parallel to Admiral Avenue, a narrow rutted road slopes downward from the street, extending between the rear of the houses and the yard. The yard is visible only to the residents of the houses who use this small lane to access their garages, which front onto it (see view 3 of Figure 6-24).

On the south and southwest, the yard is bordered by Traffic Avenue, which runs parallel to the yard, and Mafera Park, which is adjacent. Traffic Avenue is a narrow commercial street that is lined with 1-story brick warehouse buildings of utilitarian appearance (see view 4 of Figure 6-24). These buildings form a wall along the north side of the street, blocking all views to the yard. There is also a paved parking lot on Traffic Avenue, providing partial views of the yard, above fencing. This view is available for a short distance on tree-lined, residential Gates Avenue. From Mafera Park, a predominantly open, grassy area surrounded by a chain-link fence, only the top of the railroad bridge, described above, is visible above a tall, densely woven metal fence that borders the yard, since this portion of the yard is at a lower grade than the park (see view 5 of Figure 6-25).

To the southeast, Otto Road borders the yard. Like Traffic Avenue, this is a narrow street and its north side is similarly lined with 1-story nondescript brick warehouses and commercial buildings, as well as areas hidden by tall opaque fencing. The yard is only visible from the area immediately surrounding Otto Road's intersection with 68th Street, a residential street, as there is no fencing and an open paved area connects the street to the yard (see view 6 of Figure 6-25). The railroad tracks and stored freight cars are visible, as is the railroad bridge in the distance to the southwest (see view 1 of Figure 6-23).

HIGHBRIDGE YARD, THE BRONX

AFFECTED AREA

Highbridge Yard is an isolated parcel of land bordered by the Harlem River on the west, MTA Metro-North Railroad's (MNR) Hudson Line tracks and the elevated roadbed of the Major Deegan Expressway (I-87) on the east, the elevated Depot Place (Highbridge Ramp) access road on the north, and the Major Deegan Expressway elevated ramp on the south (see Figure 6-26 and view 1 of Figure 6-27). The yard is at the same grade as the Harlem River shoreline and has an irregular shape corresponding to the shoreline's curving configuration. The yard has a vacant unused look. It consists of a primarily paved area bordered by unmaintained lightly vegetated areas with several trailers and modern, 1-story, architecturally nondescript structures located throughout the area. The yard also includes railroad tracks, frequently used to store railroad cars.

VISUAL CONTEXT

Due to the yard's isolated location, described above, it is visible only from limited locations. Across the Harlem River from the site, the Manhattan shoreline consists of the at-grade and elevated portions of Harlem River Drive, the surrounding densely wooded steep slope of Highbridge Park, and two complexes of tall apartment buildings. However, since the heavily vegetated slopes of Highbridge Park are not open to the public, the yard is only visible from the park from a paved public observation walkway farther west in the park at West 172nd Street. This walkway terminates to the north at High Bridge Water Tower, a tall, 200-foot-high octagonal stone tower that is both a historic and visual resource (see view 2 of Figure 6-27). The yard is also visible from the tall residential buildings across the river. From the Manhattan side of the river, Highbridge Yard appears as a low industrial area in front of tall residential buildings (see view 3 of Figure 6-28).

Along the eastern edge of the yard, the MNR tracks are set in stone ballast and run north-south between the yard and a strip of overgrown land with scattered refuse that separates the tracks from the multilane Major Deegan Expressway. Passengers on MNR have quick, passing views of the yard as the trains pass by the area. The Major Deegan, which runs at a higher elevation than the yard, parallels the railroad tracks and acts both as a visual corridor through the area and as a visual barrier to views of the yard from the east (see view 1 of Figure 6-27). East of the Major Deegan, Sedgwick Avenue, a one- and two-way road depending on location, parallels the highway and runs at the same grade. Tall coursed stone walls that divide opposing traffic on the Major Deegan Expressway and the concrete retaining walls that border portions of it to the west block views of the yard to passing vehicular and pedestrian traffic along this street. To the east, the land rises sharply upward from the river and highway, and the yard is only visible from a few scattered locations. Limited views are available from the stairs that connect University and Sedgwick Avenues at West 165th Street and from behind a barbed wire fence surrounding a residential parking lot on University Avenue between West 165th and 166th Streets.

To the north, the yard is fully visible from High Bridge, a visual resource that is a striking former aqueduct that spans the Harlem River and Major Deegan Expressway (the bridge is shown in view 3 of Figure 6-28). The bridge has in the past served as a pedestrian walkway, but it is currently closed to the public, except for a few days a year for special events. When publicly accessible, this bridge provides clear views of the yard and across to the Manhattan shoreline (see view 1 of figure 6-27).

South of the yard, the elevated concrete and metal Major Deegan access ramp crosses the MNR tracks and obstructs views from the south.

C. FUTURE CONDITIONS COMMON TO ALL ALTERNATIVES

In the future, it is anticipated that the visual character of the study areas will remain unaltered or will change minimally, based on the normal development patterns and pressures specific to each area. Projects projected for completion by 2010 or 2020 and general trends within each of the study areas are described below.

MANHATTAN ELEMENTS

Within GCT, it is anticipated that repairs and projects designed to improve the appearance and circulation within the terminal will continue. However, since GCT is a National Historic Landmark, is listed on the State/National Registers, and is a New York City Landmark, it is anticipated that any changes will be in keeping with the visual character of the existing building. Around GCT, in the area of the proposed ventilation facility and off-street pedestrian entrances, it is unlikely that there will be many significant visual changes as this area is densely built up with predominantly large, fully occupied office buildings. Within this immediate vicinity of the terminal, there are no vacant lots open for development. Buildings could, of course, be demolished and larger, new structures erected in their place, as is the case with the Bear Stearns World Headquarters building—currently being erected at 383 Madison Avenue, on the full block bounded by Madison and Vanderbilt Avenues between East 46th and 47th Streets—and the planned development of a new building at 310 Madison Avenue, between 41st and 42nd Streets.

QUEENS ELEMENTS

In the area of the Queens alignment, several future projects will change the visual character of the yards and the immediate area. The proposed renovation and reconstruction of the currently closed and dilapidated Honeywell Street bridge that spans the yards will improve the visual character of the immediately surrounding area and generate greater vehicular and pedestrian activity at the bridge. The planned widening of the Queens Boulevard bridge will also change the appearance of that cramped, dark bridge, also creating wider, more spacious sidewalks, while at the same time relieving conspicuous traffic congestion. The plans also include installation of a concrete Jersey barrier between the new sidewalk and vehicle lanes for pedestrian safety, and new decorative railings along the sides of the bridge.

North of Sunnyside Yard, new development of large office buildings is anticipated close to Northern Boulevard south of Queens Plaza by 2010 (for more discussion, see Chapter 3, "Land Use, Zoning, and Public Policy"). These new offices will most likely bring new pedestrian activity to the area. In addition, north of Queens Plaza, NYCT will be completing its 63rd Street Connector Project by 2001, ending the use of the large parcel at 41st Avenue as a construction staging area.

BLISSVILLE, MASPETH, FRESH POND, AND HIGHBRIDGE YARDS

No significant visual changes are anticipated within or surrounding Blissville, Maspeth, or Fresh Pond Yards, as these areas are not subject to intense development pressures. At Highbridge Yard, it is possible that a new residential development, proposed on a platform over Highbridge Yard, may significantly alter the visual appearance of the area by erecting new residential and community-related buildings (see Chapter 3, "Land Use, Zoning, and Public Policy"). In addition, the possible construction of an easement in the area of the vacant land parcel separating Highbridge Yard and the Major Deegan Expressway, to connect to a proposed Bronx waterfront esplanade north and south of Highbridge Yard, will also change the visual character of the Bronx shoreline in this area. However, none of these plans have progressed since the Department of City Planning's 1993 *Plan for the Bronx Waterfront* was published (see Chapter 3). Therefore, they may not be pursued prior to construction of the proposed project.

D. PROBABLE IMPACTS OF THE PROJECT ALTERNATIVES

The following discussion considers the potential impacts on visual and aesthetic considerations that may result from the operation of the project alternatives. Impacts during construction are documented separately in Chapter 17, "Construction and Construction Impacts."

The analysis considers the visual impacts of the project alternatives on the study areas. The visual and aesthetic conditions are described for those areas seen at street level and do not consider the effects the alternatives have below the surface (tunnels, tracks and platforms, substations, and underground ventilation facilities), since these areas are not visible to the public.

NO ACTION ALTERNATIVE

The No Action Alternative is the benchmark against which other project alternatives are compared. In this alternative, existing visual conditions would not alter dramatically. Conditions would be the same as discussed above under "Future Conditions Common to All Alternatives." Therefore, the No Action Alternative would not have any significant adverse impacts on visual character.

TSM ALTERNATIVE

As described above, the Transportation Systems Management (TSM) Alternative would require construction of project elements separate from the Preferred Alternative. Visible project elements—including a new pedestrian bridge connecting the LIRR and subway stations at the Hunters Point Avenue bridge, construction of a new covered pedestrian walkway between the Long Island City LIRR station and the East River ferry terminal at Long Island City, possible construction of a new ferry slip at the ferry terminal, and construction of new flyover and entrance ramps within the LIE right-of-way—are anticipated to make visual changes, but not significantly alter the visual character of any of the surrounding areas.

The proposed new pedestrian bridge to connect the LIRR and subway stations at Hunters Point Avenue would be constructed contiguous with the east side of the Hunters Point Avenue bridge and at the same height. It is anticipated that the new walkway would be bordered by some form of protective barriers, such as concrete or chain-link fencing. It would require the widening of the bridge to accommodate the new walkway for the approximately 200-foot length between the LIRR and subway stations, and would also require the installation of new piers to support the bridge. A new, widened stairwell and new elevator from the bridge to the LIRR platform and a new subway entrance from the walkway would also be constructed. The new pedestrian bridge, which would constitute a visual continuation of the existing Hunters Point Avenue bridge, would not significantly alter the visual character of the existing bridge nor substantially change any views to the bridge. It is also not anticipated that the construction of new access stairs and an elevator to and from the new pedestrian bridge and the LIRR and subway stations, where such forms of access currently exist, would constitute a significant visual change.

The proposed 500-foot-long pedestrian walkway in Long Island City would extend west from the Long Island City LIRR station along the existing sidewalk on Borden Avenue, continue west through the existing East River ferry terminal paved parking lot, to the New York Waterway ferry slip. Though not yet fully designed, it is anticipated that the walkway would be unenclosed but covered by a roof, which would be supported by columns at even intervals along the walkway. The walkway would not obstruct any views to the water from the public right-of-way, as views are currently only permitted from within the ferry terminal parking lot due to the presence of large and multiple structures in and around the parking lot that block views from the west. The walkway itself would not negatively alter the visual context of the immediately surrounding areas, which are defined by a mixture of commercial, railroad, and ferry terminal uses. It is also possible that the existing ferry slip would be enlarged to handle a greater number of boats or larger ferries. However, since this change would only be visible from within the ferry parking lot in close proximity to the shore, no significant visual changes are anticipated. Therefore, neither the proposed walkway or enlargement of the ferry slip would have a significant adverse impact on, nor negatively alter the visual context of, the immediately surrounding areas.

The proposed new flyover ramp on the LIE would connect a west-bound lane of the LIE's north connector/distributor road to the westbound HOV lane in the center of the expressway by creating an elevated ramp that would pass overtop the existing west-bound expressway lanes, essentially providing another tier of highway structure above the existing expressway. The ramp would be at its highest point on the bridge that crosses the railroad tracks, gradually declining to the elevation of the expressway at 74th Street. Although it would be expected to be visible to some of the surrounding area, since it would be built of steel and concrete, similar to the existing

LIE structure, the new construction would not be expected to change the visual character of the LIE, already an obtrusive transportation artery in the area.

The proposed new eastbound entrance ramp, east of Queens Boulevard, would connect the south LIE service road to the LIE by constructing a ramp that would incline from the service road across the existing embankment up to the grade of the elevated expressway. The construction of a ramp within the LIE right-of-way—between its service road and the expressway itself—would not constitute a significant visual change nor alter the existing visual character of the prominent expressway structure. In addition, the new ramp would only be visible to areas south, in the area of the existing large parking lot described above, as a combination of concrete retaining walls and solid fencing along the north side of the expressway effectively blocks views of the LIE roadbed from the at-grade street level areas to the north.

Therefore, since none of the above described project elements would significantly alter the visual character of the project sites or the areas within visual proximity, no significant adverse impacts are anticipated as a result of this alternative.

PREFERRED ALTERNATIVE

MANHATTAN ELEMENTS

Grand Central Terminal (GCT)

For Option 1 (a new station in GCT's lower level), it is anticipated that proposed project elements within GCT would change the visual appearance of areas within the terminal described above. However, none of the changes proposed would constitute significant visual impacts that would adversely affect the existing visual character of the terminal. Changes in the Biltmore Room—the installation of new escalators and elevators at the northern end of the room—would permanently change the room's appearance by altering its symmetrical classical proportions. The new escalators would be at the edge of the room, close to the columns and platform entrances. Removal of the newsstand, however, which is a separate modern amenity, would likely open up the room and would have a positive visual effect. Since the room is at the edge of the Terminal and only visible from the immediate vicinity of the Biltmore Concourse and the 45th Street Passage, the proposed work would not adversely affect the terminal's overall visual character. The proposed new circulation elements would also generate a greater amount of pedestrian activity, drawing people into an aesthetically pleasing space which currently receives little use. Proposed new LIRR ticketing locations, either using existing ticket windows in the Main Concourse or conversion of modern retail space along the Shuttle Passageway, are not anticipated to have any negative, obtrusive visual effects on the bustling, heavily trafficked terminal. If the east ticketing windows in the Main Concourse are to be used for LIRR ticket operations, no changes are anticipated to the appearance of that ticket booth, except for the addition of signage, which would not alter the visual character of the booth nor the Main Concourse. If the modern stores off the Shuttle Passageway are removed and replaced with a modern ticketing area, visual character would again not be expected to be affected negatively. The replacement of modern stores with a new ticketing area in an area only minimally visible—e.g., from the Shuttle Passageway—would not constitute a significant adverse visual effect. On the Dining Concourse level, it is expected that the newly created LIRR passenger area would be visible only to the immediately surrounding area at the western edge of the existing terminal. The creation of this space would essentially enlarge and expand the existing publicly accessible area of this level. As this area would be built outside the existing public space and at the edge of the terminal, it is not expected to have a significant adverse visual effect on the overall visual character of the terminal. However, to have a positive visual effect, it is recommended that the new space be designed in keeping with the visual character of the surrounding Dining Concourse area.

For Option 2 (a new station below GCT's lower level), the LIRR passenger mezzanine would include passenger waiting areas and retail stores that would be in keeping with other uses within the terminal. Although this newly created area would extend much deeper (farther north) into the terminal, as it would be extending away from the existing public spaces of the Dining Concourse, it would not be more visually prominent than the area proposed for Option 1, and similarly would not be expected to have a significant adverse effect on the existing visual character of the terminal.

Other Areas in Manhattan

It is anticipated that the proposed new ventilation facility at 47 East 44th Street would occupy the same width and depth as the 5-story commercial building that is currently on the site and which would be demolished, but would be of a greater (though at this time undetermined) height than the structure it would be replacing. The design for this structure is still under way. The ventilation facility would be clearly visible to viewers in the buildings fronting north and south on East 44th Street on the block; to office workers, shoppers, and pedestrians on this portion of the street; and at the intersections with Madison and Vanderbilt Avenues. However, due to the height of the buildings surrounding the site, which range from 12 to 26 stories, unless the structure exceeds those heights, it would not be visible from other locations in the study area—including at other locations on Madison and Vanderbilt Avenues.

Although the off-street pedestrian entrances have not yet been fully designed, it is expected that the entrances proposed adjacent to existing structures would be covered by a shelter. They would be somewhat similar in visual character to the new entrances constructed for Metro-North's Grand Central North project. The design of the entrances would make them conspicuous to viewers in the immediately surrounding areas, although, depending on the location, visibility of the entrances would vary due to the height of the buildings within the study area, with visual range typically limited to the immediate street and not across a major avenue except for an entrance located at the corner. In addition, new signage would be added to the existing Grand Central North entrances, though such signage would only be visible within the visual range of the entrances. Due to the dense, dynamic, urban nature of the surrounding environment, characterized by older brick and newer glass and metal clad structures, it is not anticipated that the entrance structures would have a significant effect on the visual character of the surrounding area. For the entrances proposed within the stores on East 45th Street and at 335 Madison Avenue, the existing storefronts would be replaced by new entrances with marquees or canopies. Similar to the pedestrian entrances described above, the new marquees would be expected to be visually prominent, since it would extend out from the building line. However, the replacement of storefronts of contemporary design with entrances that would include a strongly articulated architectural feature would not constitute a significant adverse visual effect.

QUEENS ELEMENTS

The Yards: Yard A, Sunnyside Yard, and the LIRR Tracks

Within the yards, the proposed demolition of several brick structures at the northern edge of Sunnyside Yard would change the appearance of this portion of the yards. However, this change would not alter the visual character of the yards as a complex network of railroad tracks and old and new buildings. In addition, since this portion of the yards is visible only from a few dead-end streets south of Northern Boulevard, to authorized traffic en route to the yards from the Honeywell Street bridge and from limited locations on the Queens Boulevard bridge, this proposed change would not be visually prominent and would not constitute a significant adverse visual effect on the surrounding area.

The construction of the new Sunnyside station, however, is anticipated to be more visually prominent. The station would be constructed adjacent to and on the west side of the Queens Boulevard bridge, approximately 400 feet north of Skillman Avenue (see Figure 2-19 in Chapter 2, "Project Alternatives"). Although not yet fully designed, it would consist of a central headhouse and three separate parallel train platforms. The headhouse would be located at street level with the Queens Boulevard bridge and would open onto the west sidewalk of the bridge, housing the LIRR ticket office, waiting room, and other LIRR uses. The structure would have a strong, dynamic design to orient and attract passengers. The current design favors a primarily transparent building, built of stainless steel and glass. The headhouse would be located above the center island platform with glass-enclosed pedestrian walkways connecting down to cylindrical vertical circulation towers on the platforms north and south of it, and canopied escalators extending down to the central platform. A walkway would extend southward from the headhouse and through the vertical circulation tower on the south platform to a bus/van/auto drop-off/pick-up area to be created on the north side of Skillman Avenue. On the bridge, a pedestrian barrier would be installed between the sidewalk and vehicle lanes to prevent drop-offs or pick-ups of passengers at the station headhouse instead of at the designated area on Skillman Avenue. This could be a new barrier or an improvement to the Jersey barrier present without the project. On the west side of the bridge, canopied stairs would provide access down to the central platform.

The bridge-level headhouse connecting covered stairways to the platforms would be as visible west of Queens Boulevard along Skillman Avenue, as is the double-story Queens Boulevard bridge. The station, if designed in a striking, modern, primarily transparent aesthetic described above, along with new, decorative, railings along the Queens Boulevard bridge, would constitute a bright, positive visual effect on the surrounding area, currently defined by nondescript commercial buildings and the dark, cramped, congested visual character of the Queens Boulevard bridge.

Other proposed changes within the yards are not anticipated to alter their visual character. These include the construction within the Harold Interlocking, which would add new tracks, but would not change the general appearance of the Amtrak/LIRR tracks or surrounding Sunnyside Yard areas. Proposed rearrangement and installation of new tracks within Yard A would similarly not be expected to alter the visual character of the yard as a wide network of railroad tracks. Construction of new facilities within Yard A, such as a train washer and service and inspection shop, would only add to the existing mixture of old and new structures located within the yards, therefore not altering their visual character. Overall, Yard A would appear to be more actively used with the project.

Other Queens Elements

It is anticipated that the demolition of the warehouse buildings on the south side of Northern Boulevard, and replacement with a new LIRR facility would change the appearance of the site at 2950-2970 Northern Boulevard. However, since the site is located in a manufacturing/commercial area that is defined by nondescript structures that are predominantly blocked from view along Northern Boulevard by the elevated train superstructure, it is not anticipated that these changes would negatively affect the surrounding area within visual proximity nor constitute a significant adverse visual effect.

East of the yards, the proposed demolition of a commercial building at the northwest corner of 43rd Street and the LIRR bridges, and construction of new bridges across 43rd and 48th Streets to carry the new Harold Interlocking tracks, would not significantly alter the appearance of the immediately neighboring areas. The removal of one utilitarian brick structure out of several of similar appearance, and the construction of bridges, expected to be similar to the existing ones, would not noticeably change the visual character of the area in the vicinity of 43rd Street, 42nd Place, 37th Avenue, and 48th Street.

Work along the LIRR train embankment, including embankment modifications and viaducts, is not expected to negatively affect the properties located on the north side of 37th Avenue, which already have clear views of the embankment. However, along the north side of Barnett Avenue, the possible demolition of the garages and commercial structures along the railroad embankment between 43rd and 48th Streets could lead to adverse visual effects on the residential properties located across Barnett Avenue and the streets that abut it, although the proposed work would not alter the historic character of the Sunnyside Gardens neighborhood (see Chapter 7, "Historic Resources," for further details). The 1-story garages and commercial buildings, except where there are small paved parking lots with no structures, form an effective visual barrier from the embankment and passing trains. In order to avoid adverse effects, if the buildings are to be demolished, they would be replaced in kind once construction is complete. This would return the permanent visual barrier that existed prior to project construction.

BLISSVILLE YARD, QUEENS

Rehabilitation of the abandoned rail yard, including grading and removal and replacement of railroad tracks for subsequent freight car storage, would change the visual appearance of the yard by improving its current derelict condition. It is not anticipated that new elements and the resulting greater activity in the yard would have a significant adverse visual effect on the surrounding area, as there are no sensitive viewer groups or significant visual resources in the view shed. As described above, the closest viewers are the industrial and commercial properties located north and south of the yard, which are unlikely to be affected by any greater activity in the yard. Possible new security fencing would further help screen views into the yard, which is currently completely visible from the south.

MASPETH YARD, QUEENS

The proposed work within Maspeth Yard would not significantly alter the visual character of the yard and therefore would not have an adverse effect on the surrounding area. Proposed grading, installation of switches and signals, and construction of new storage tracks within an existing active rail yard and subsequent storage of more railroad cars would not greatly alter the visual quality or urban design of the yard. In addition, as described above, the yard is not visible from many locations. Where it may be seen, viewer groups typically consist of passing traffic on commercial streets and workers in the commercial/manufacturing buildings. Where the yard is visible from residential properties east of Rust Street, the proposed work would not be conspicuous enough to have a negative visual impact on the viewers.

Possible new security fencing around the yard would likely be more visually prominent, but would give the perimeter of the yard a more maintained and less dilapidated appearance. It would also more effectively screen views into it.

FRESH POND YARD, QUEENS

The proposed construction of a new maintenance facility in the triangular portion of the Fresh Pond Yard would have no adverse visual impacts on the surrounding area because it would hardly be visible. As described above, this part of the yard can only be seen from one location, at Otto Road and 68th Street. Since it is likely that the structure would be built at the widest portion of the yard, this would place it farther away from Otto Road and deeper into the yard, where it would be most difficult to see form outside the yard. Possible new security fencing may be more visually prominent in locations where heavy fencing does not exist around the perimeter of the yard, but would not be expected to cause any significant adverse impacts, since the yard can only be seen in very few locations. Other work proposed in the yard to relocate existing utilities to allow construction and servicing of the new shop would have no visual impact, since the completed work would be underground.

HIGHBRIDGE YARD, THE BRONX

Proposed work within Highbridge Yard—including construction of new tracks, platforms, structures, an enclosed employee overpass over the Hudson Line tracks, and new security fencing—would change the visual character of the yard by adding to and improving an infrequently used facility. In addition, the proposed project would introduce a greater amount of activity and personnel. Since the yard is immediately bordered by such physical barriers as the Harlem River and elevated roadways—the Major Deegan Expressway, its access ramps, and Depot Place—the proposed changes within the yard and anticipated greater amount of activity would not have an adverse effect on any sensitive residential uses, which are located farther away. Where the yard is visible, such as from Highbridge Park or residential complexes in Manhattan or from areas on University Avenue, these locations are at a sufficient distance—and across from a river or major highway—to render the change in visual appearance of the yard, and any new activities that may occur there, negligible. If the High Bridge pedestrian walkway should be opened to the public, it is not anticipated that any visual changes created in the yard by the addition of new tracks, platforms, or structures, or heightened activity within an already existing rail yard, would have a significant effect on viewers on the bridge. New construction would not obstruct any views from the bridge nor interfere with the primary views on the bridge looking north and south along the Harlem River.

New security lighting at the yard would consist of low-level standard pole-mounted lights designed with shielding as required to shield sensitive viewers in the viewshed from glare. Therefore, the increased lighting at the yard would not adversely affect residential uses across the Major Deegan Expressway or the Harlem River from the site. Further, the proposed new lighting is not anticipated to have any significant adverse effects on the closest visual resource—High Bridge—which is itself illuminated at night.

E. MITIGATION MEASURES

To address potential visual impact concerns of the possible demolition of the garage and commercial buildings between Barnett Avenue and the LIRR embankment between 43rd and 48th Streets on the residential neighborhood across Barnett Avenue, these buildings would be replaced in kind once construction is complete. This would replace the permanent visual barrier that currently exists there.

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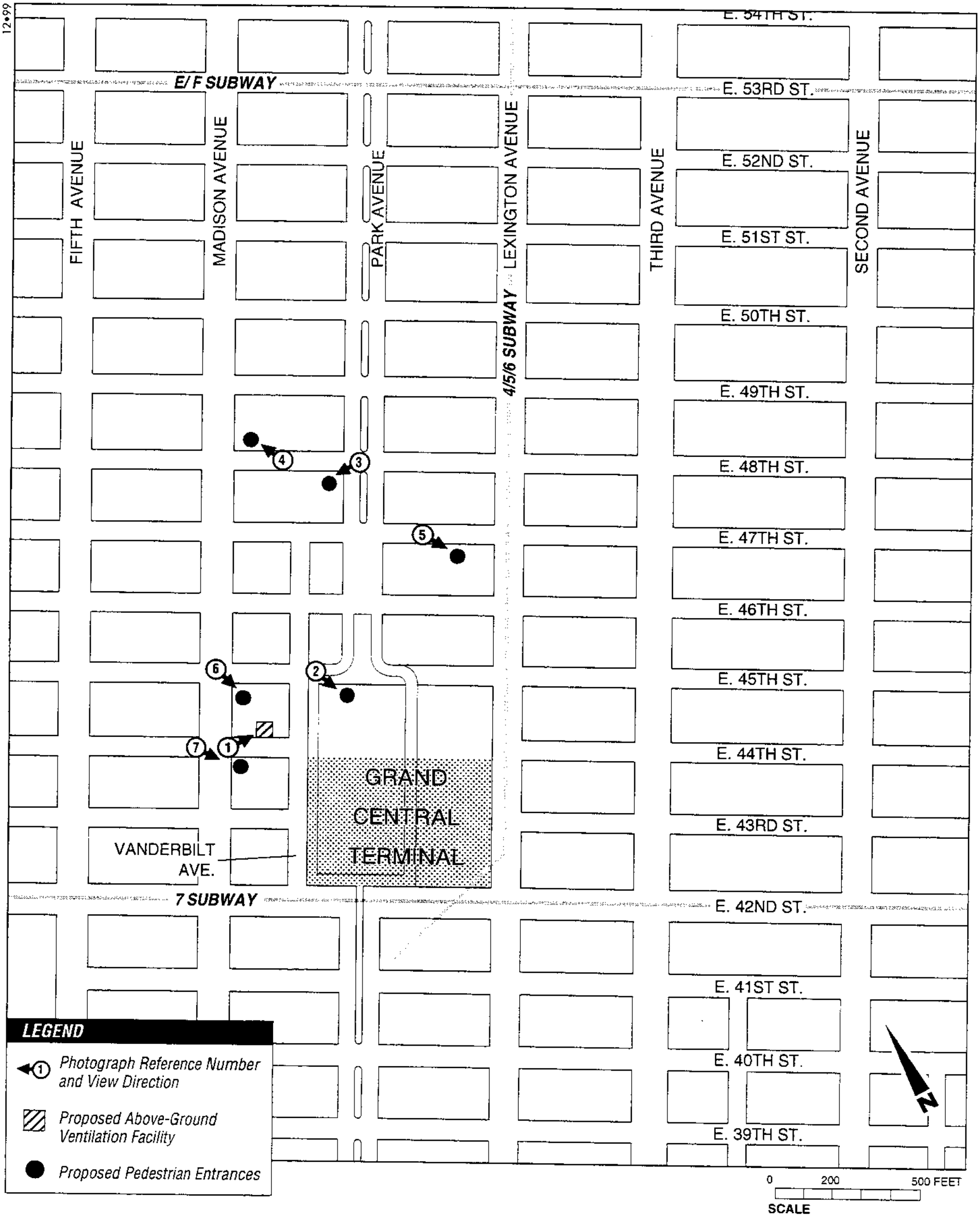
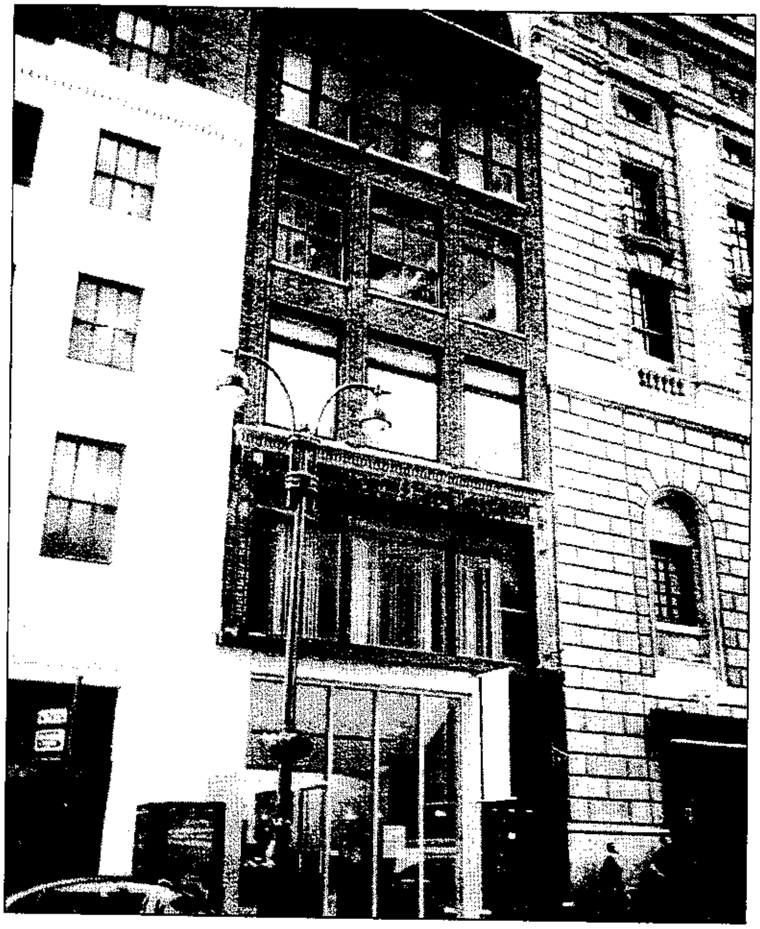
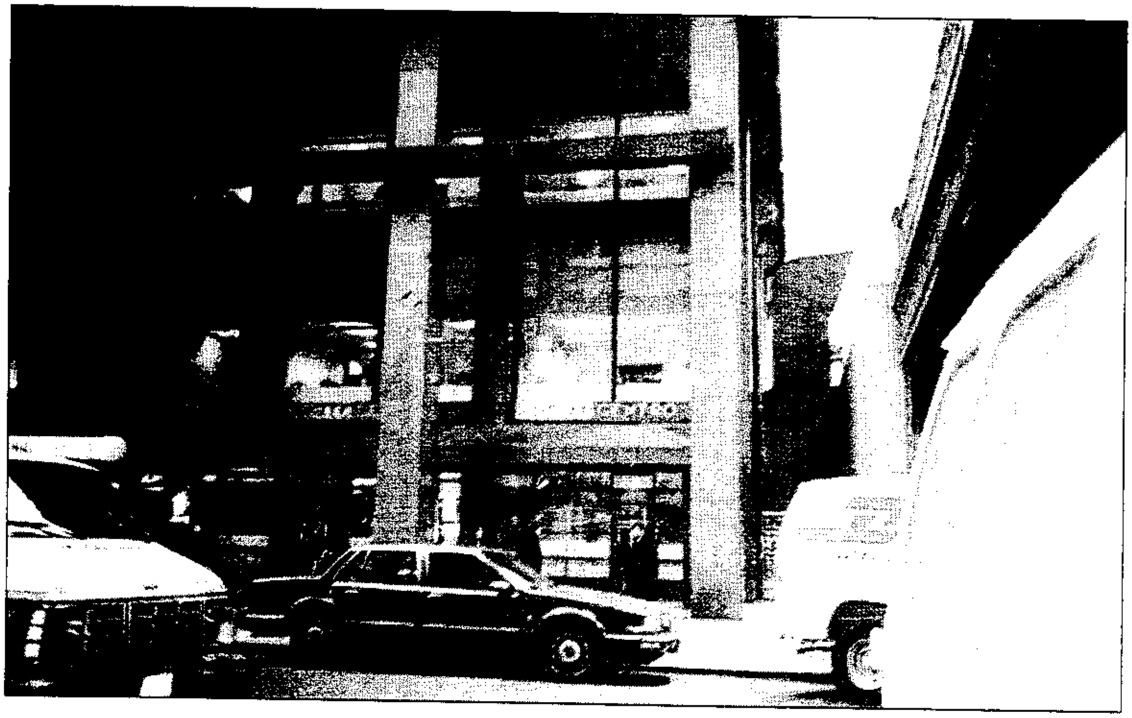


Figure 6-1

Manhattan Alignment – Key to Photographs



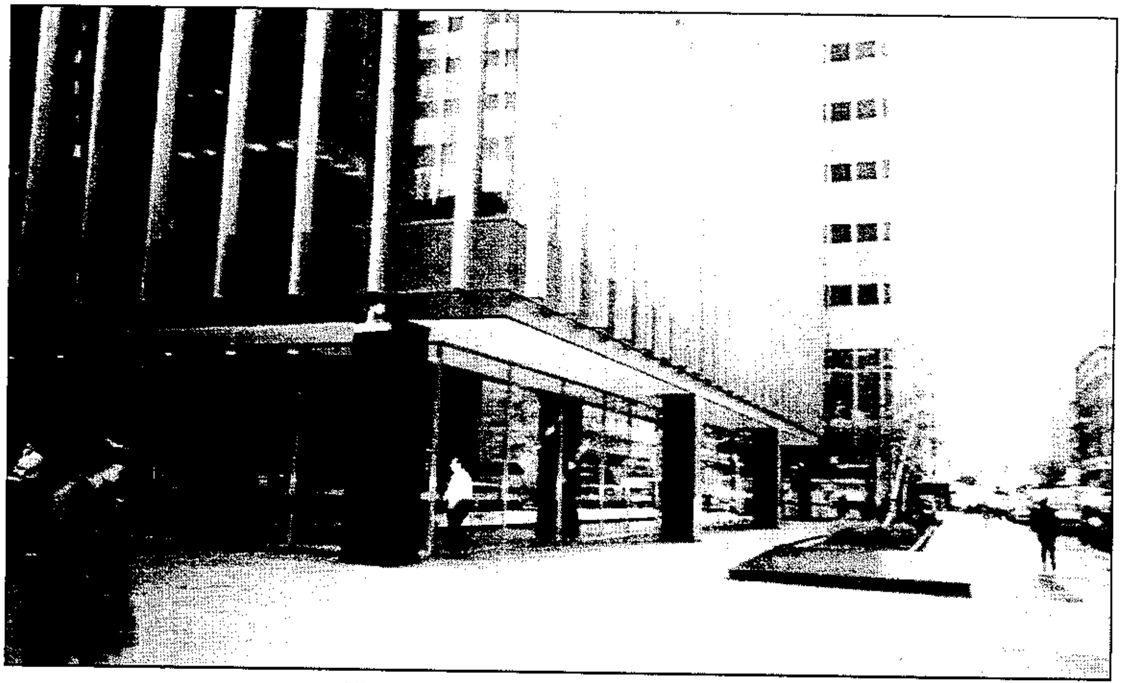
1
View of 47 East 44th Street, site of the proposed ventilation facility



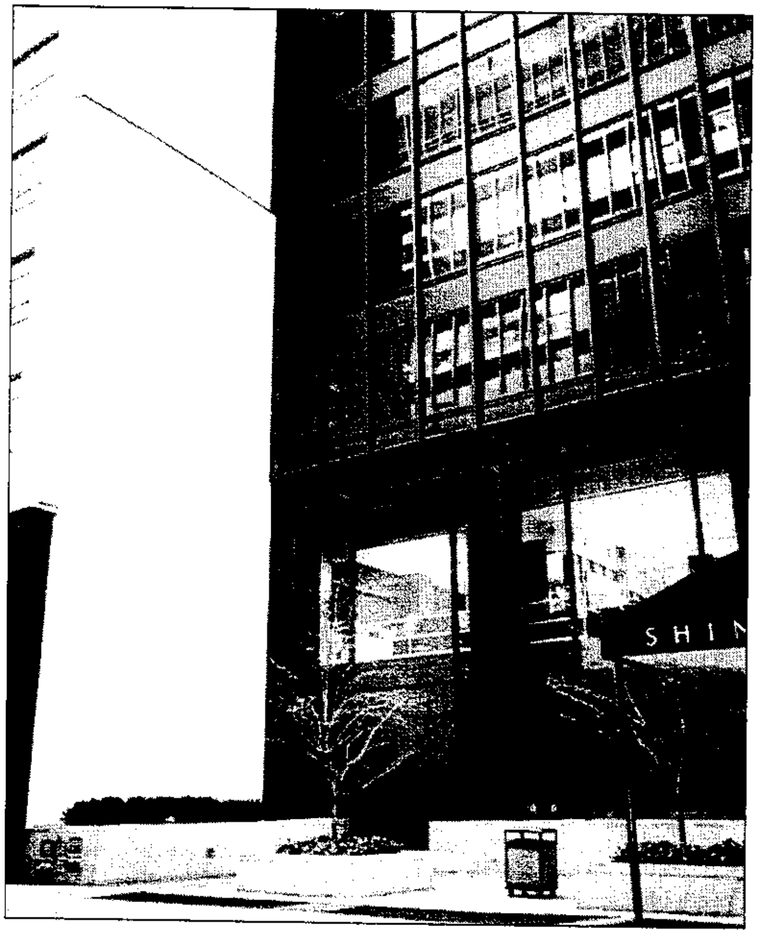
View of the southeast corner of 200 Park Avenue from East 45th Street 2

Figure 6-2

Manhattan Alignment – Views of the Affected Areas



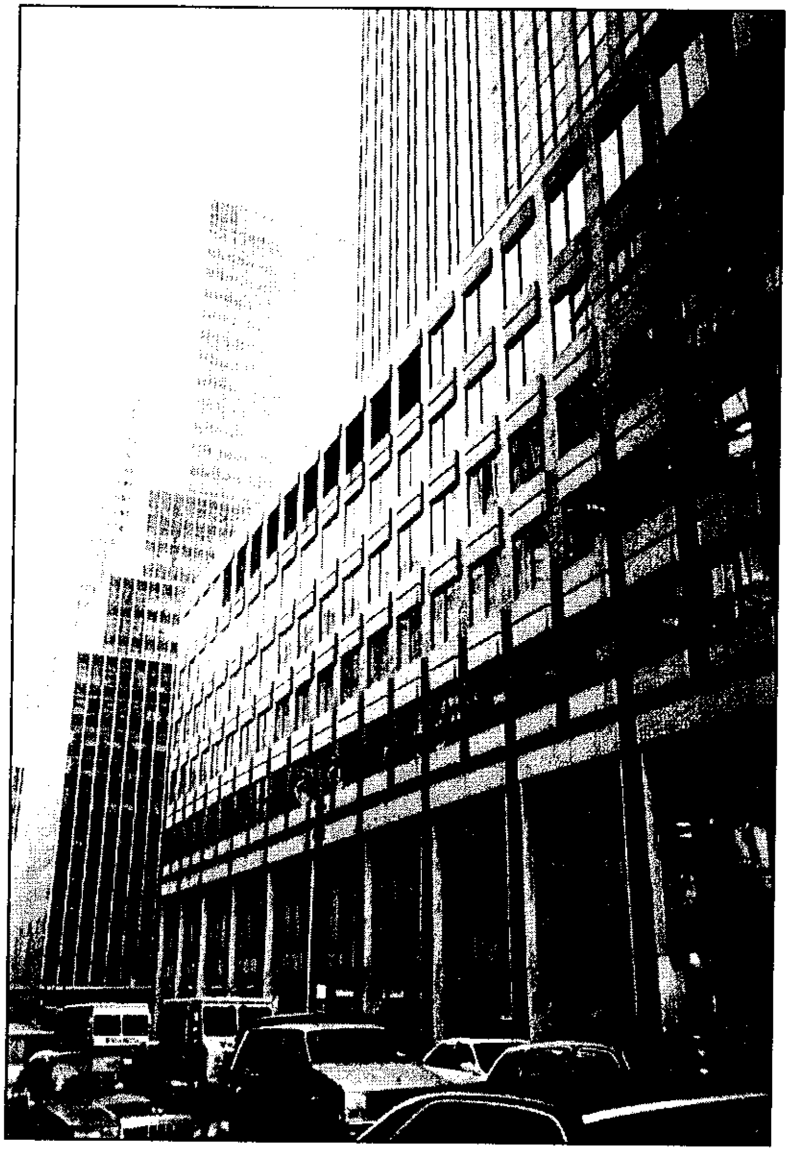
View west of 270 Park Avenue and the south side of East 48th Street **3**



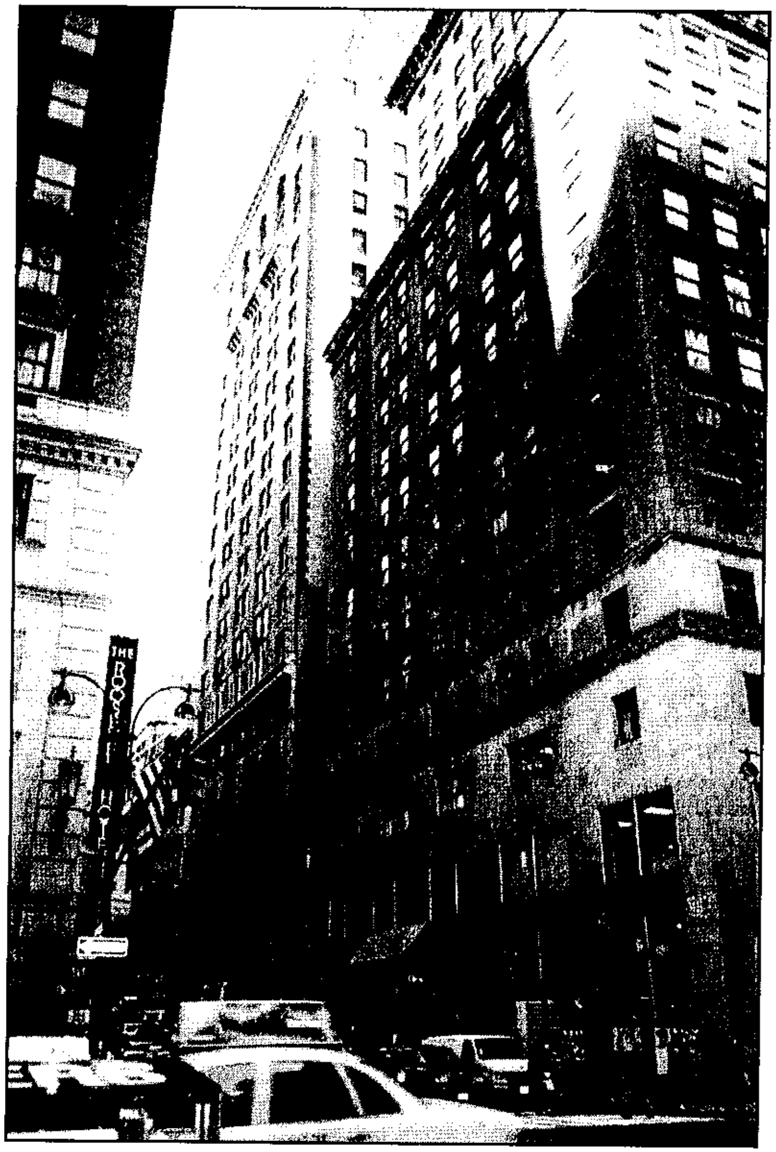
4
View of 280 Park Avenue and
the north side of East 48th Street

Figure 6-3

Manhattan Alignment – Views of the Affected Areas



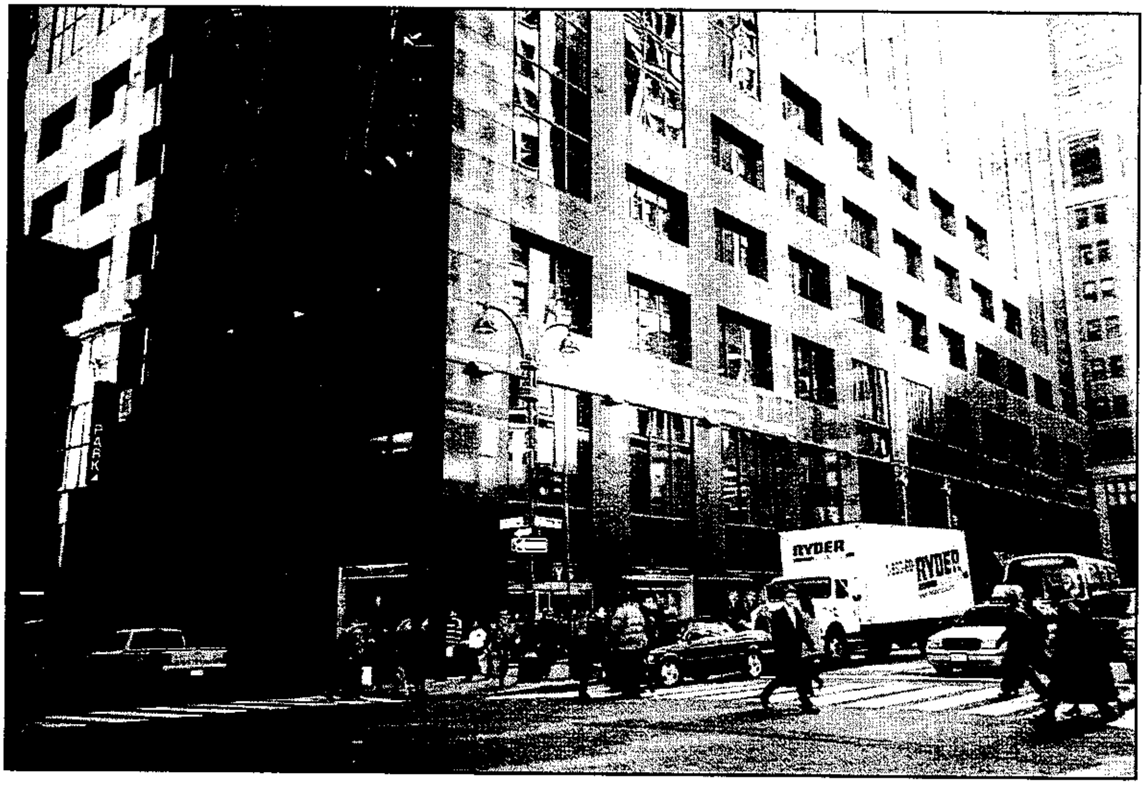
View east of 245 Park Avenue from about midblock **5**



View east of 347 Madison Avenue and south side of East 45th Street **6**

Figure 6-4

Manhattan Alignment – Views of the Affected Areas



View southeast of the corner of 335 Madison Avenue at East 44th Street **7**

Figure 6-5

Manhattan Alignment – Views of the Affected Areas

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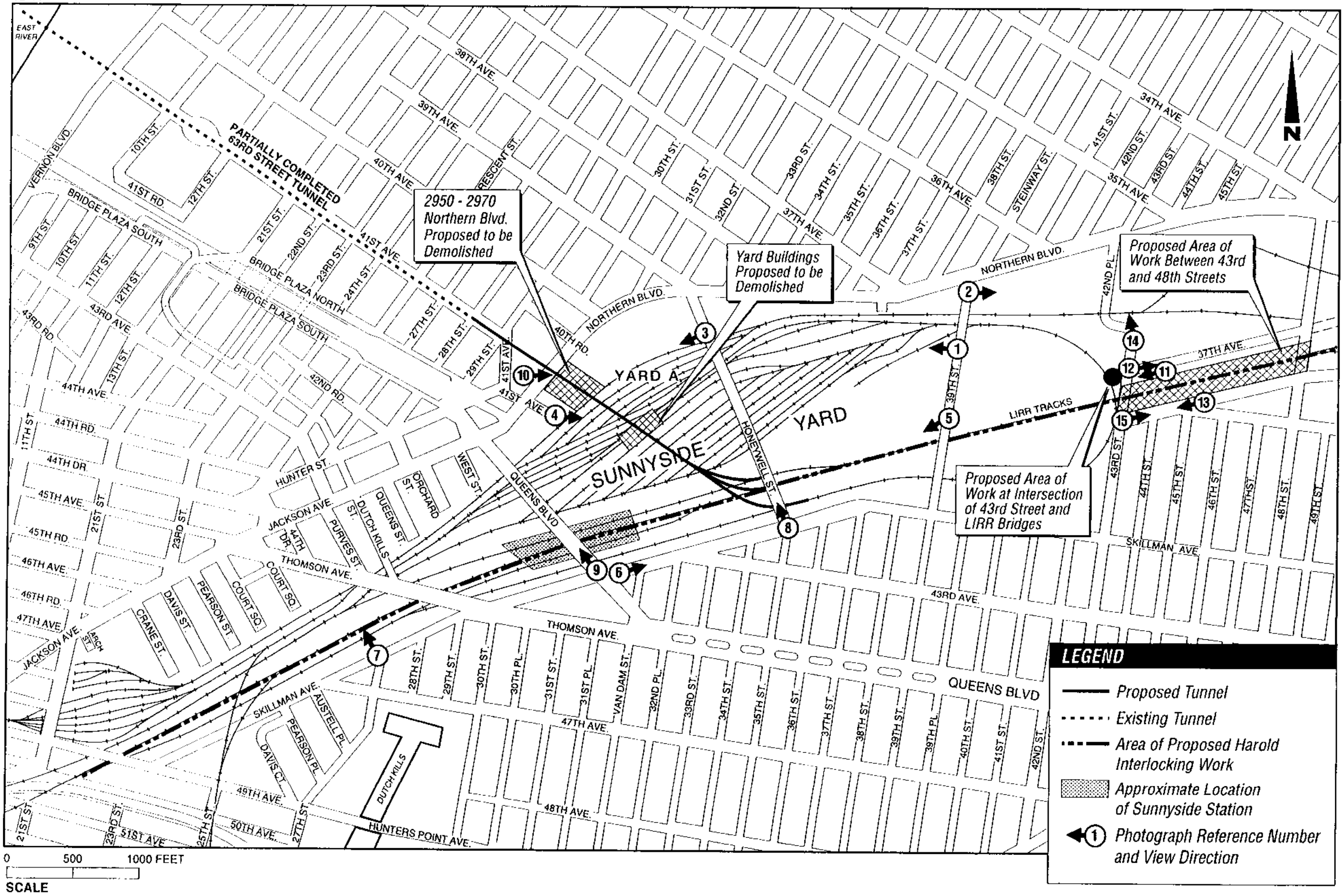
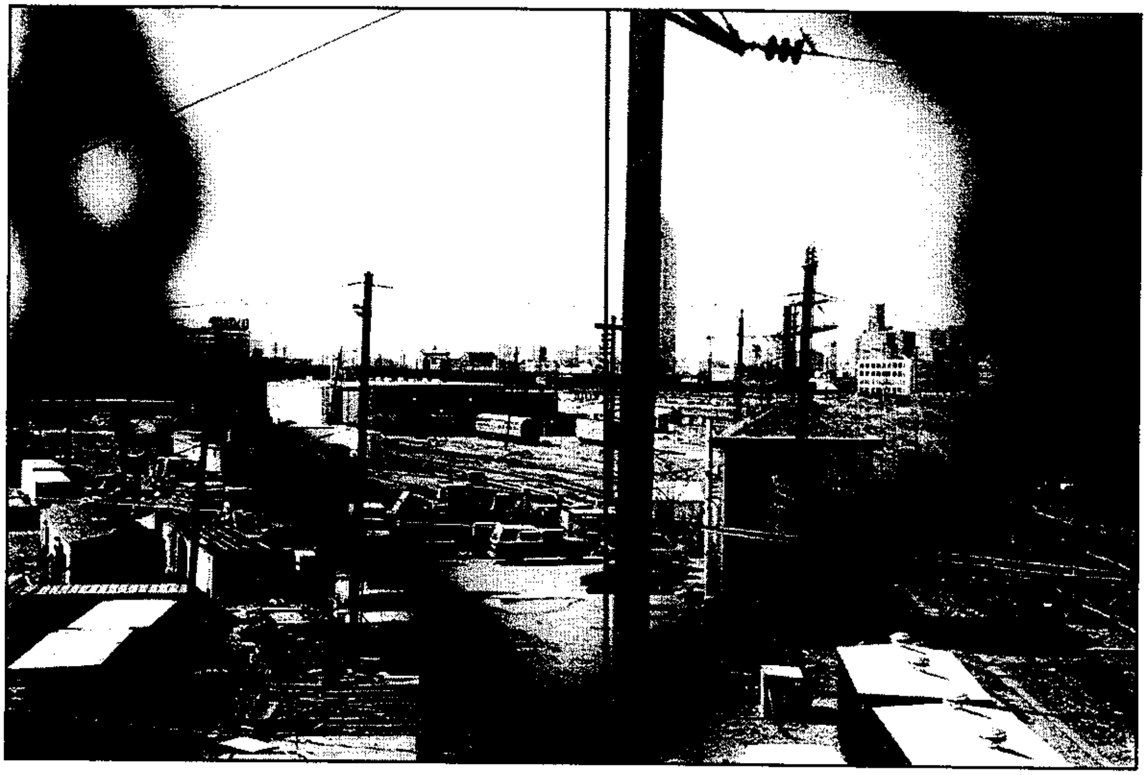


MTA / LIRR

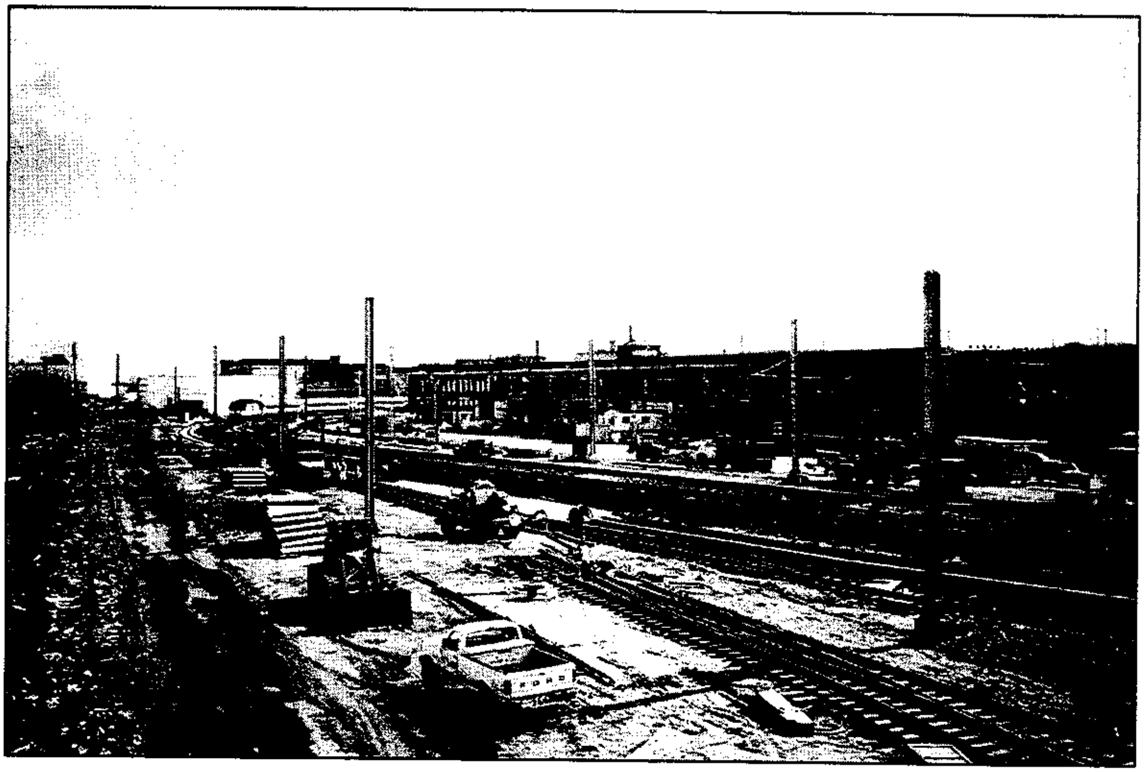
East Side Access

Figure 6-6

Queens Alignment – Key to Photographs



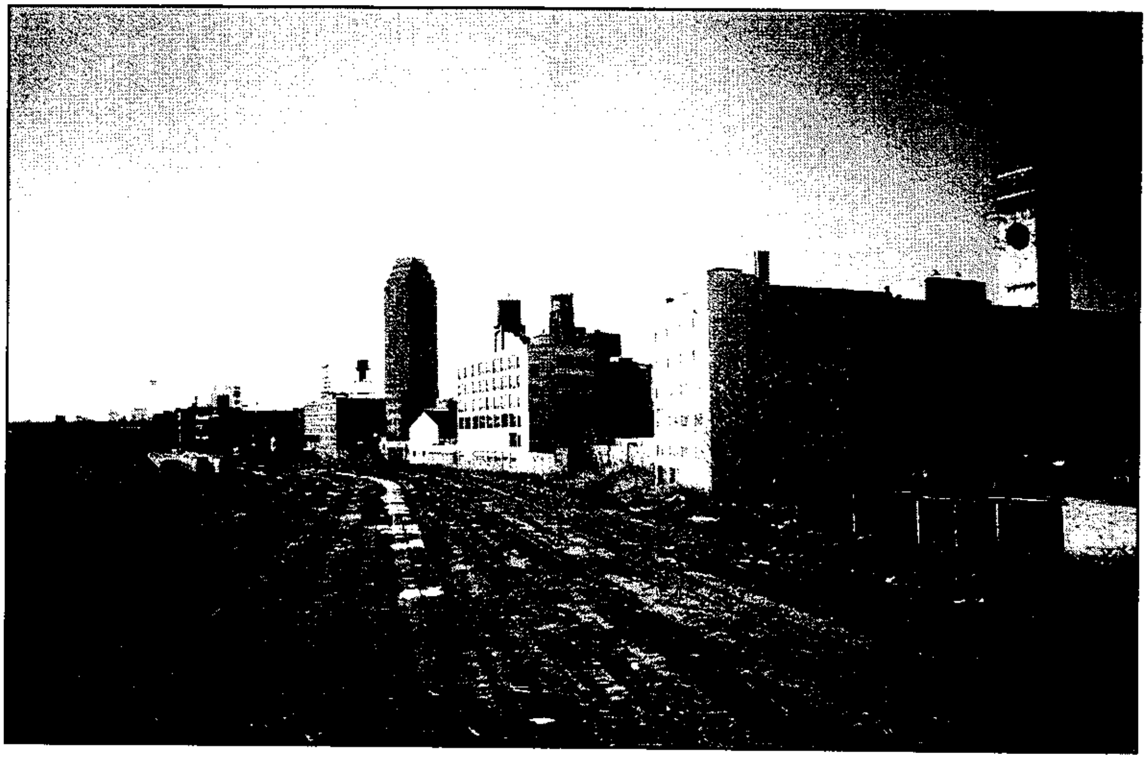
View west through chain-link fencing on the 39th Street Bridge **1**



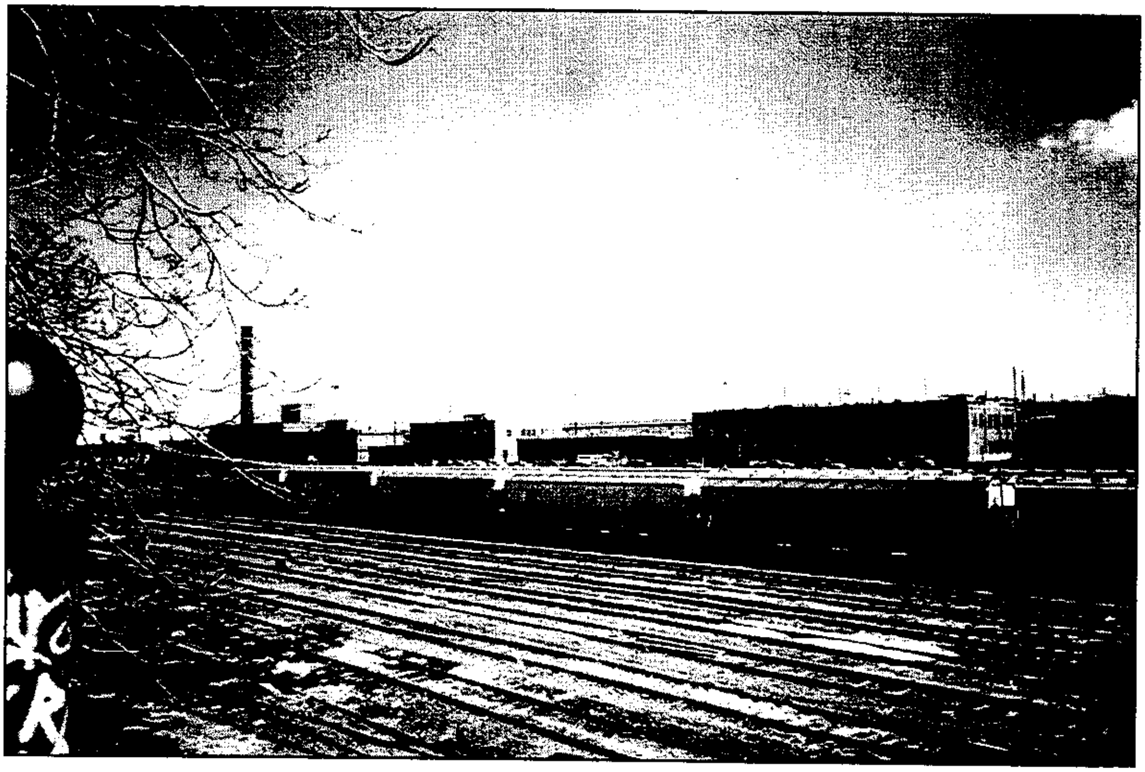
View east from the 39th Street Bridge **2**

Figure 6-7

Queens Alignment, the Yards – Views of the Affected Areas



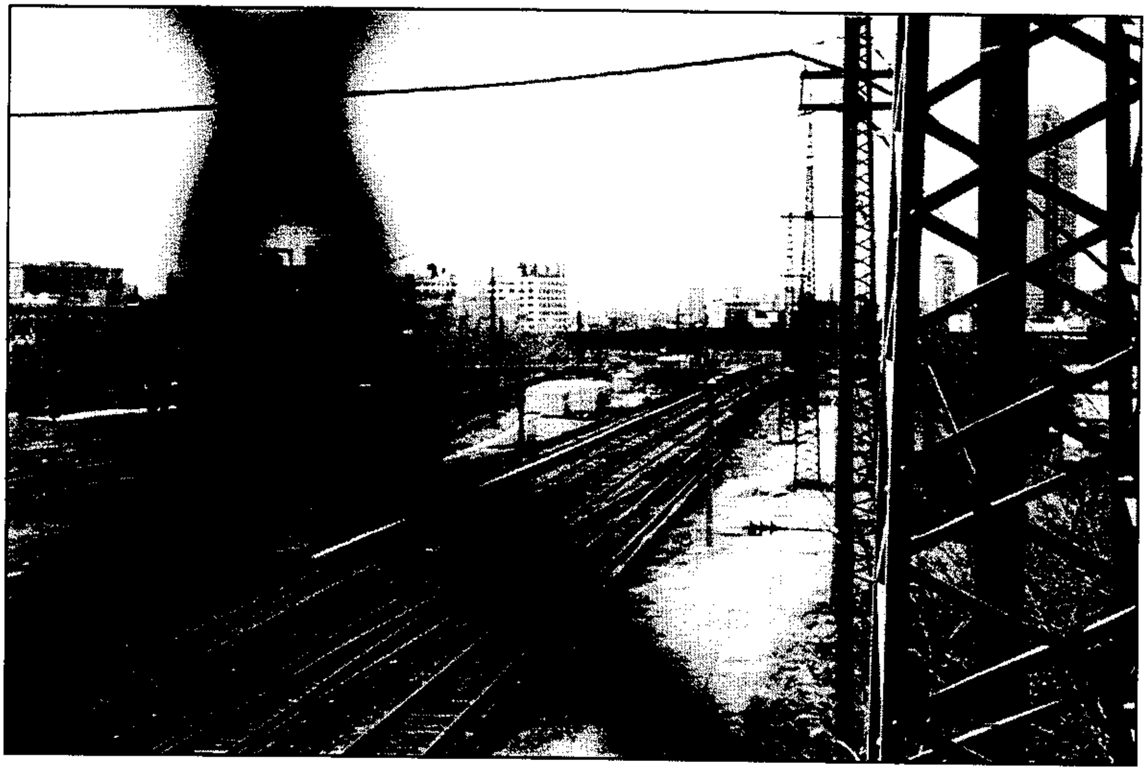
View west of Yard A from the Honeywell Street Bridge **3**



View southeast from foot of 41st Avenue **4**

Figure 6-8

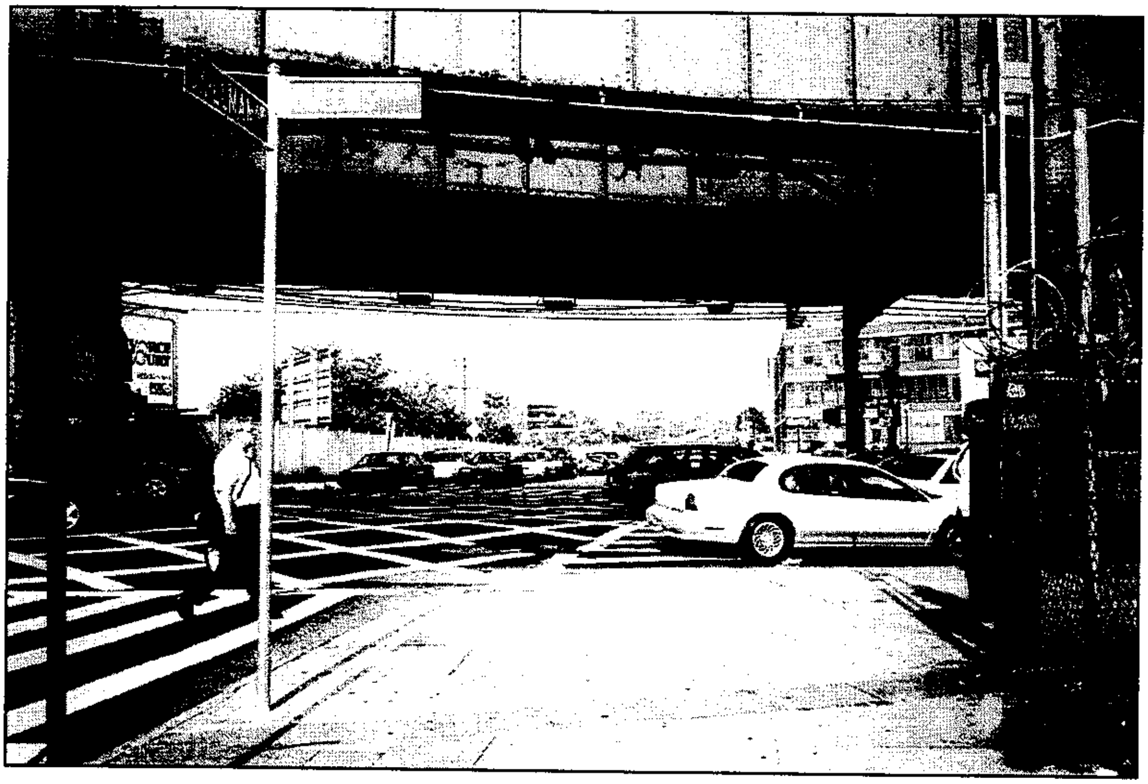
Queens Alignment, the Yards – Views of the Affected Areas



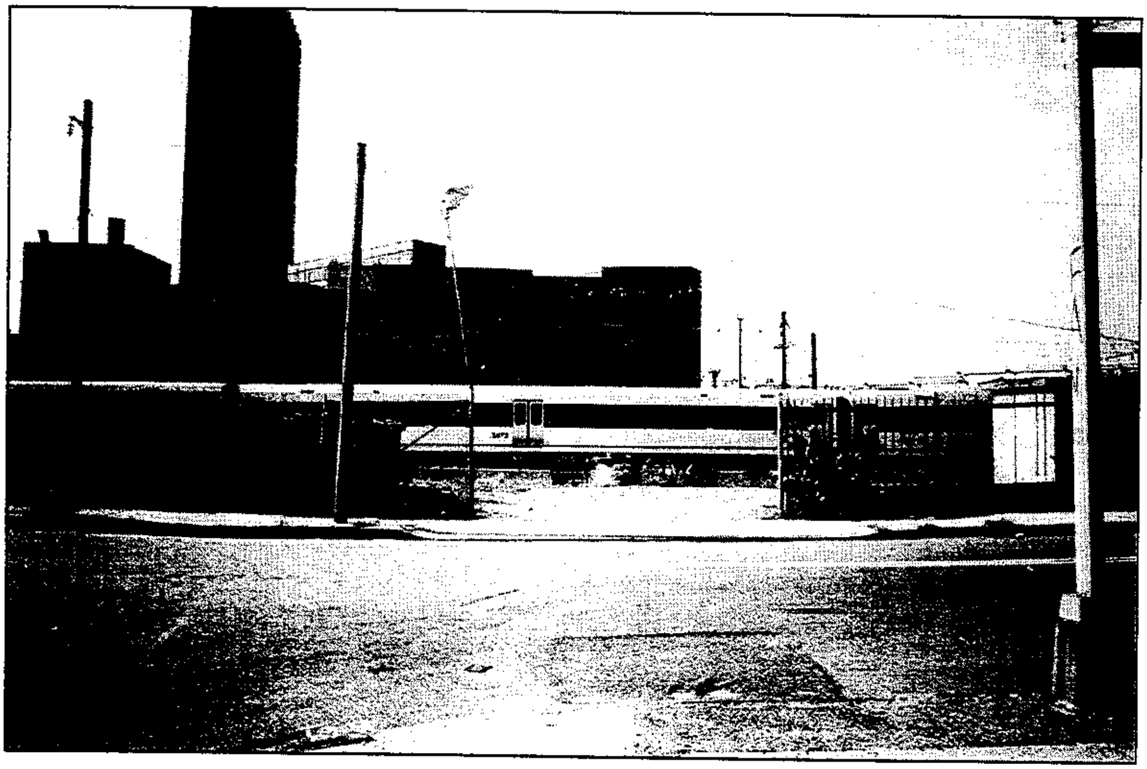
View west of the LIRR tracks through chain-link fencing from the 39th Street Bridge **5**

Figure 6-9

Queens Alignment, the Yards – Views of the Affected Areas



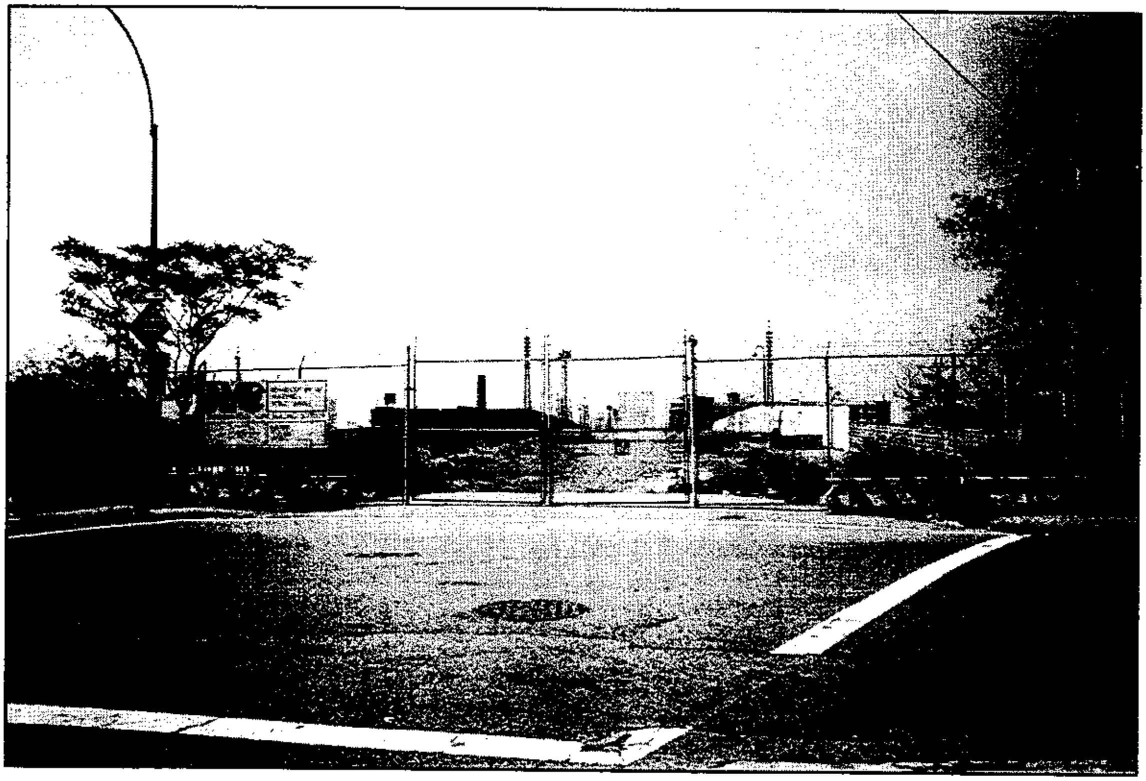
View east on Skillman Avenue at Queens Boulevard **6**



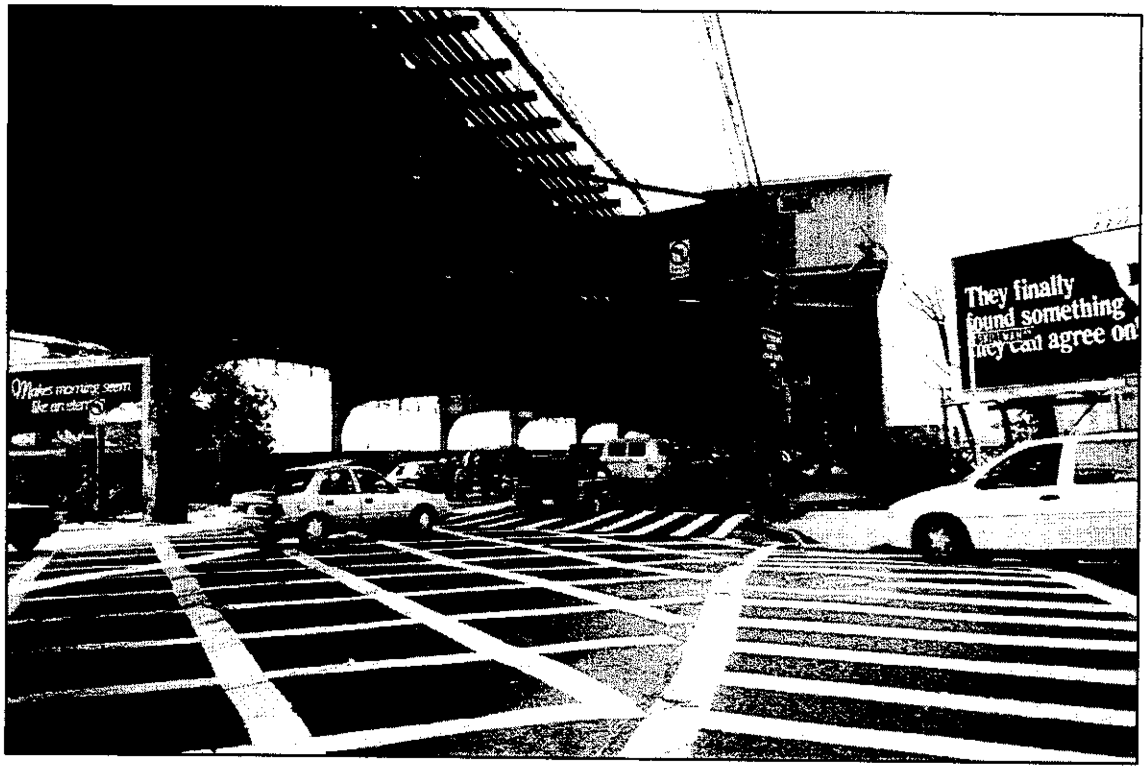
View north from Skillman Avenue at 27th Street **7**

Figure 6-10

Queens Alignment, the Yards – Visual Context



View north of the Honeywell Street Bridge from Skillman Avenue **8**

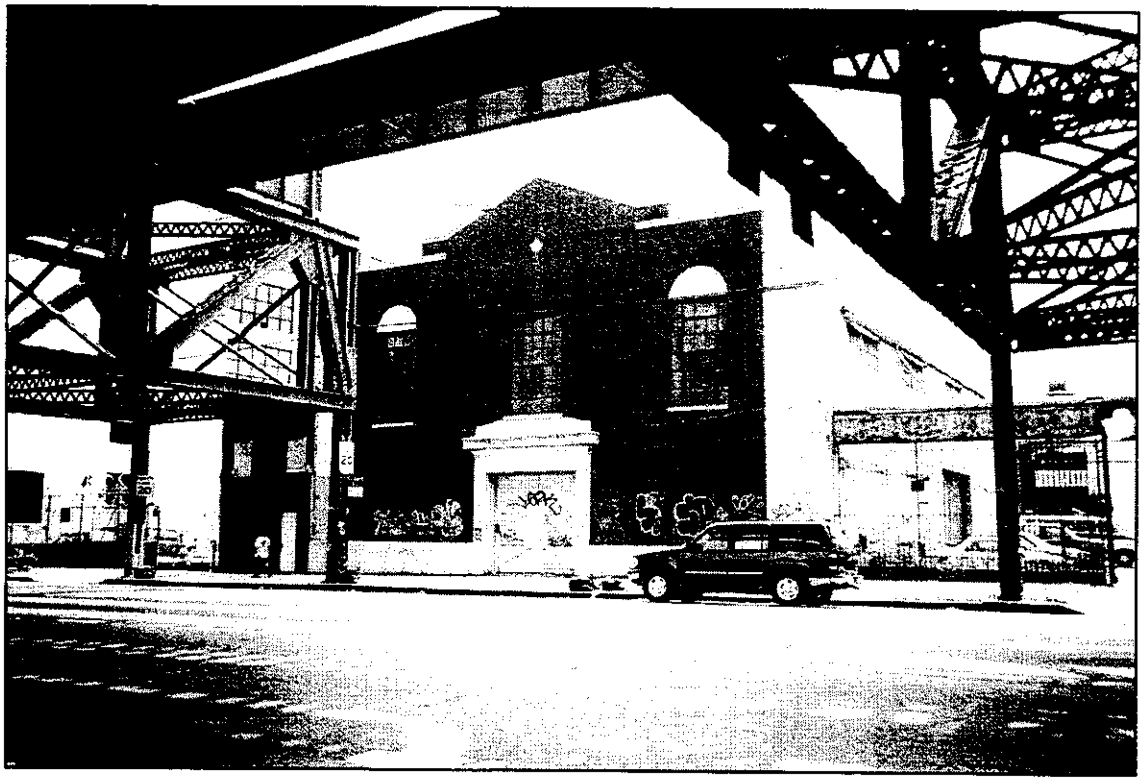


Makes morning seem like an event
They finally found something they can agree on!

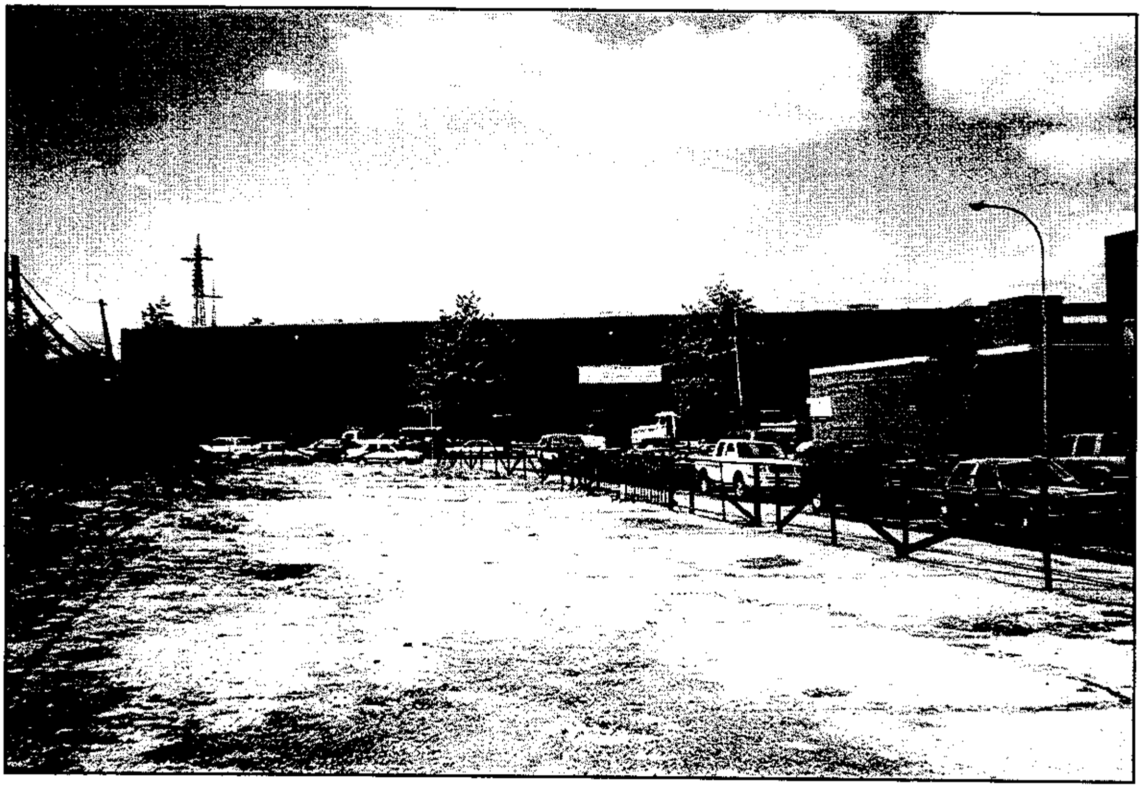
View north of the Queens Boulevard Bridge from Skillman Avenue **9**

Figure 6-11

Queens Alignment, the Yards – Visual Context



View south of two of the manufacturing structures at 2950-2970 Northern Boulevard **10**

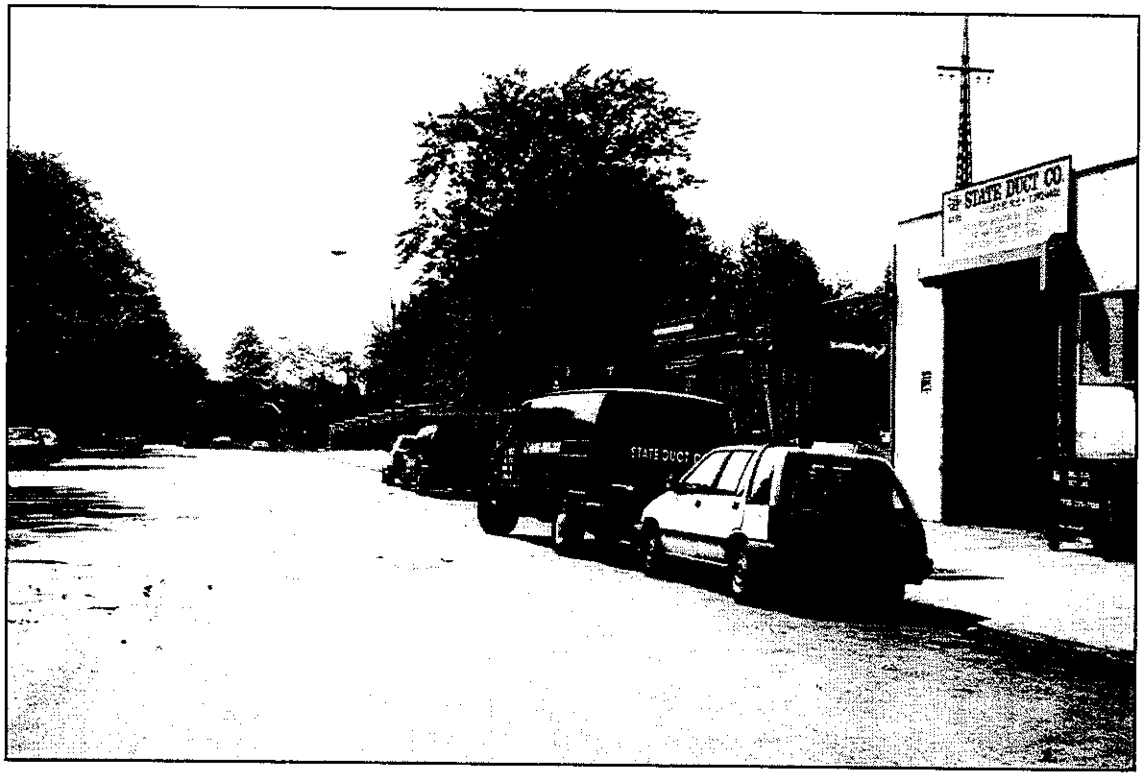


View west of the commercial building at the intersection of 43rd Street and the LIRR bridges **11**

Figure 6-12

Other Areas Associated with the Queens Alignment – View of the Affected Areas

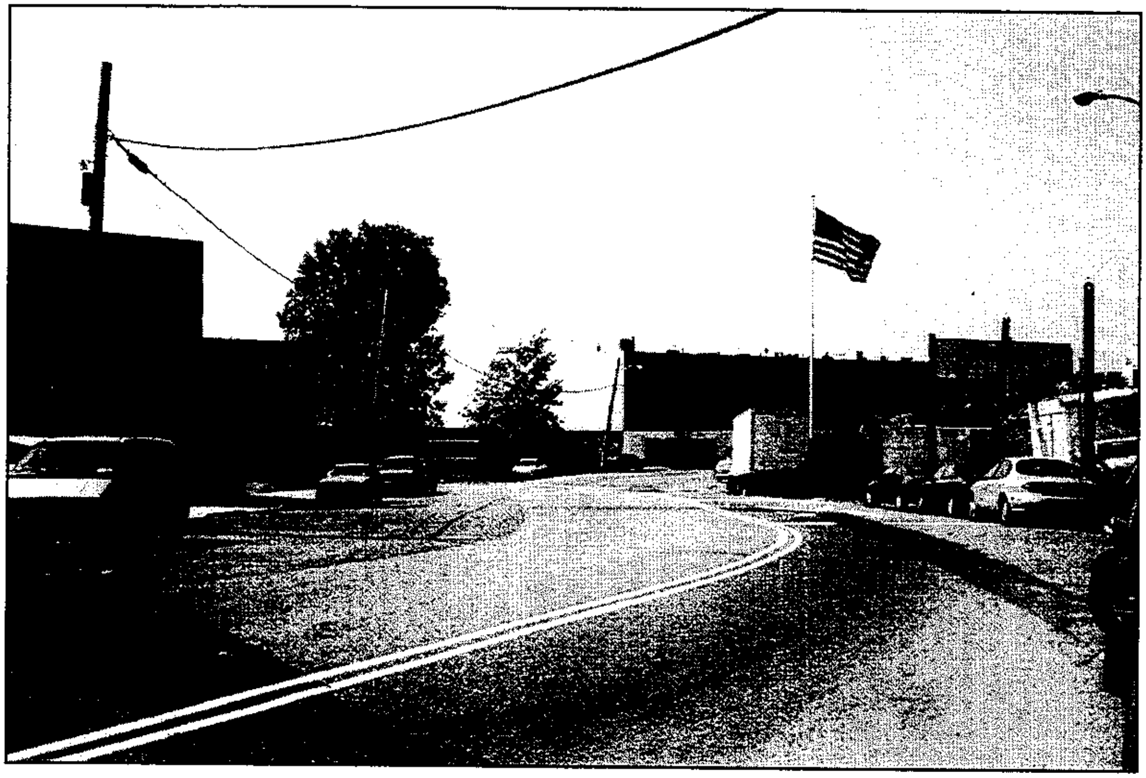
View east on 37th Avenue from 43rd Street. The project site is on the right **12**



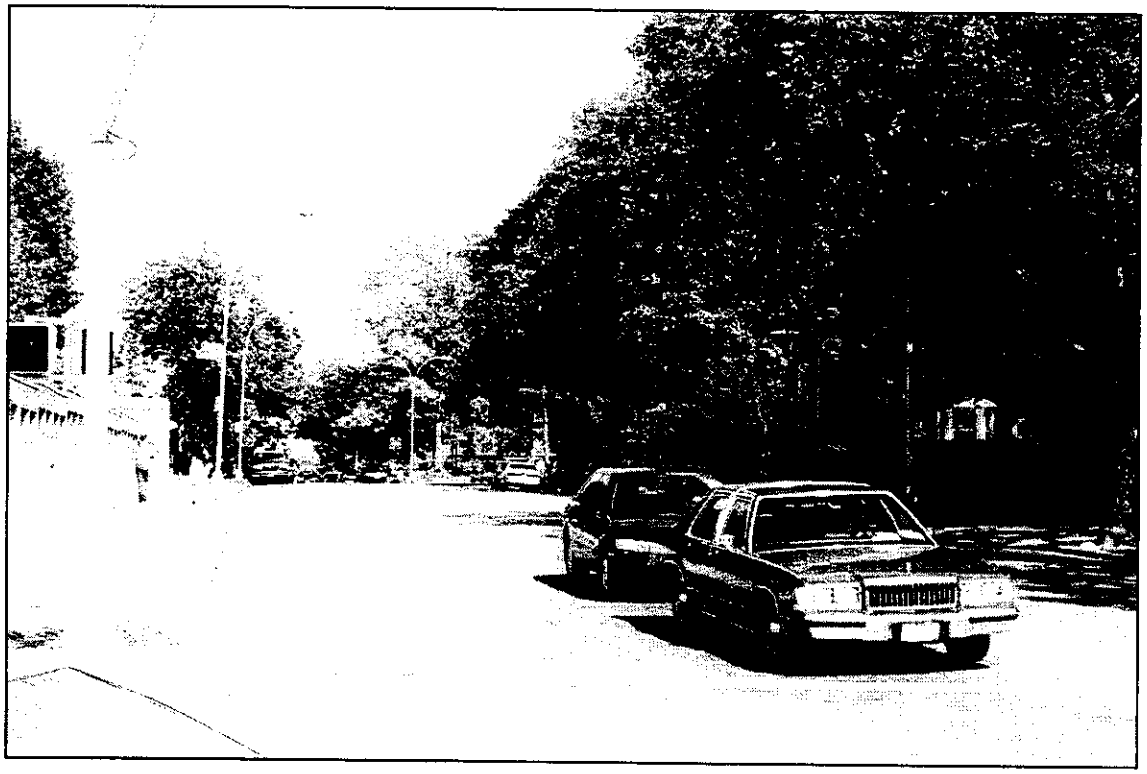
View west of the north side of Barnett Avenue from 45th Street. The project site is on the right. **13**

Figure 6-13

Other Areas Associated with the Queens Alignment – Views of the Affected Areas and Visual Context



View north on 43rd Street from 37th Avenue **14**



View east on Barnett Avenue from 43rd Street. The project site is on the left **15**

Figure 6-14

Other Areas Associated with the Queens Alignment – Visual Context

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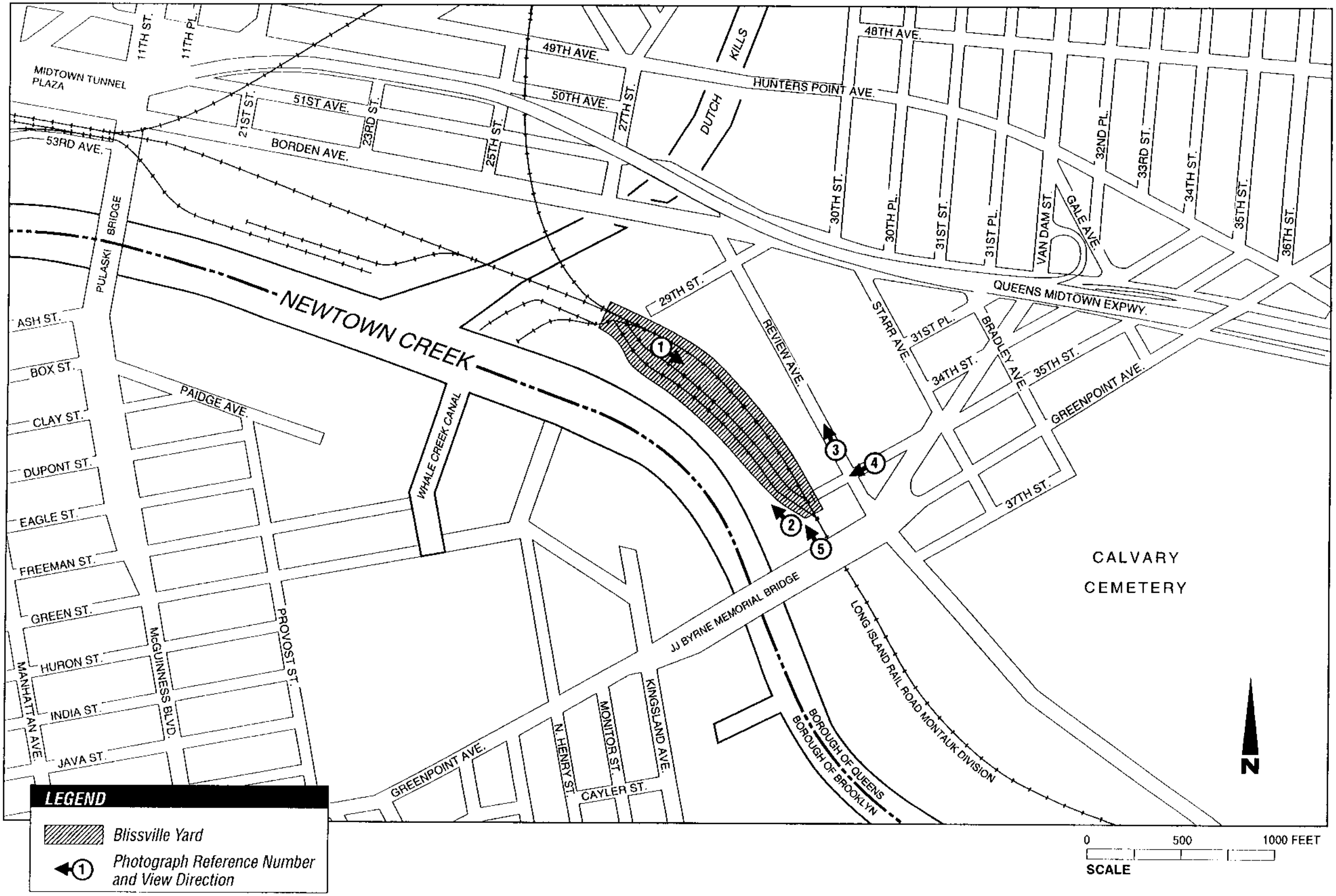
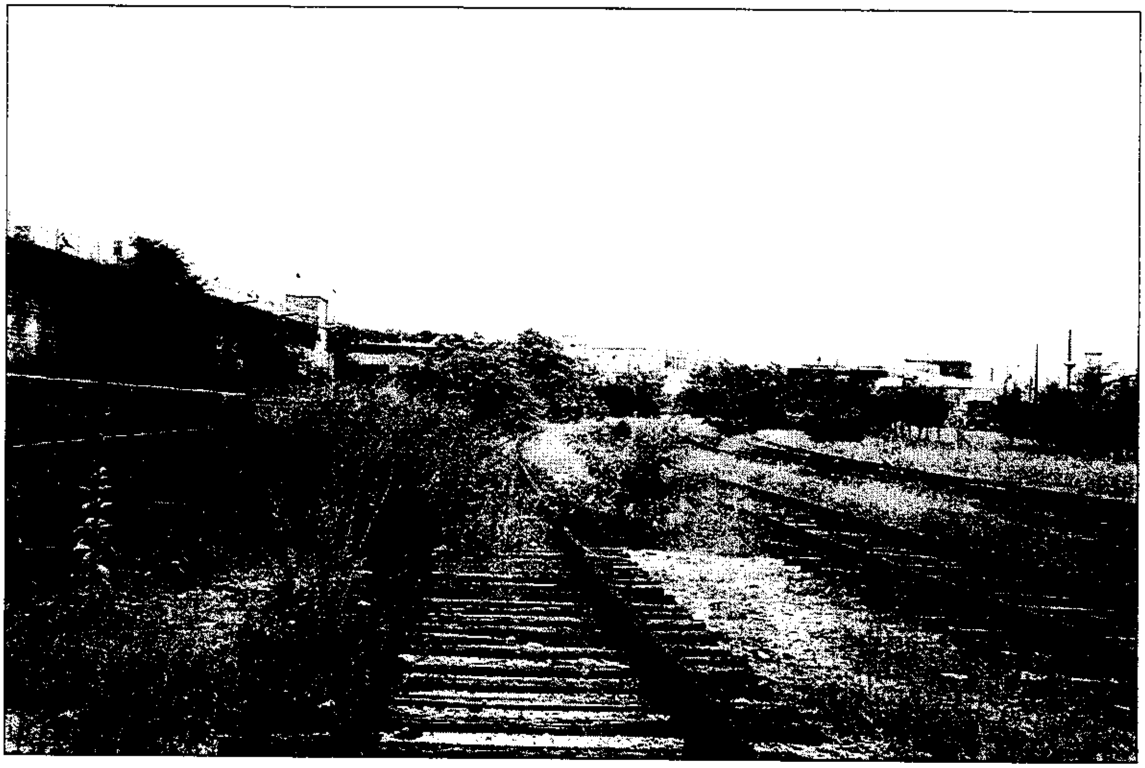
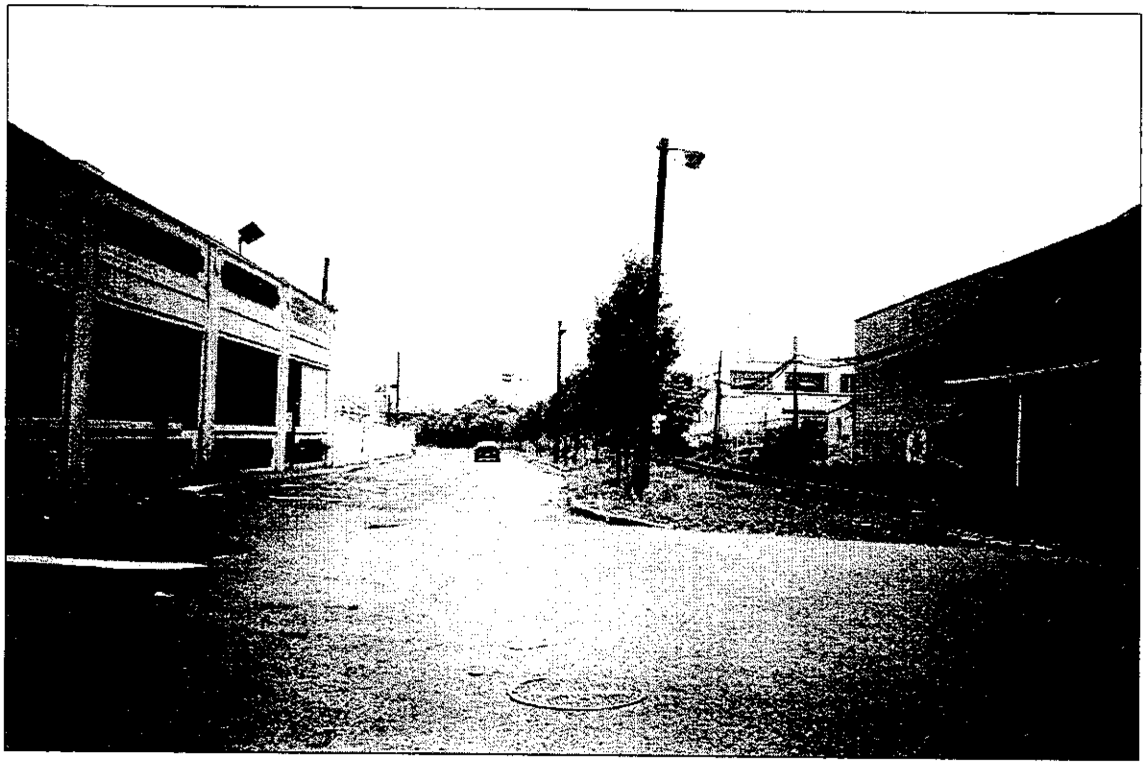


Figure 6-15

Blissville Yard – Key to Photographs



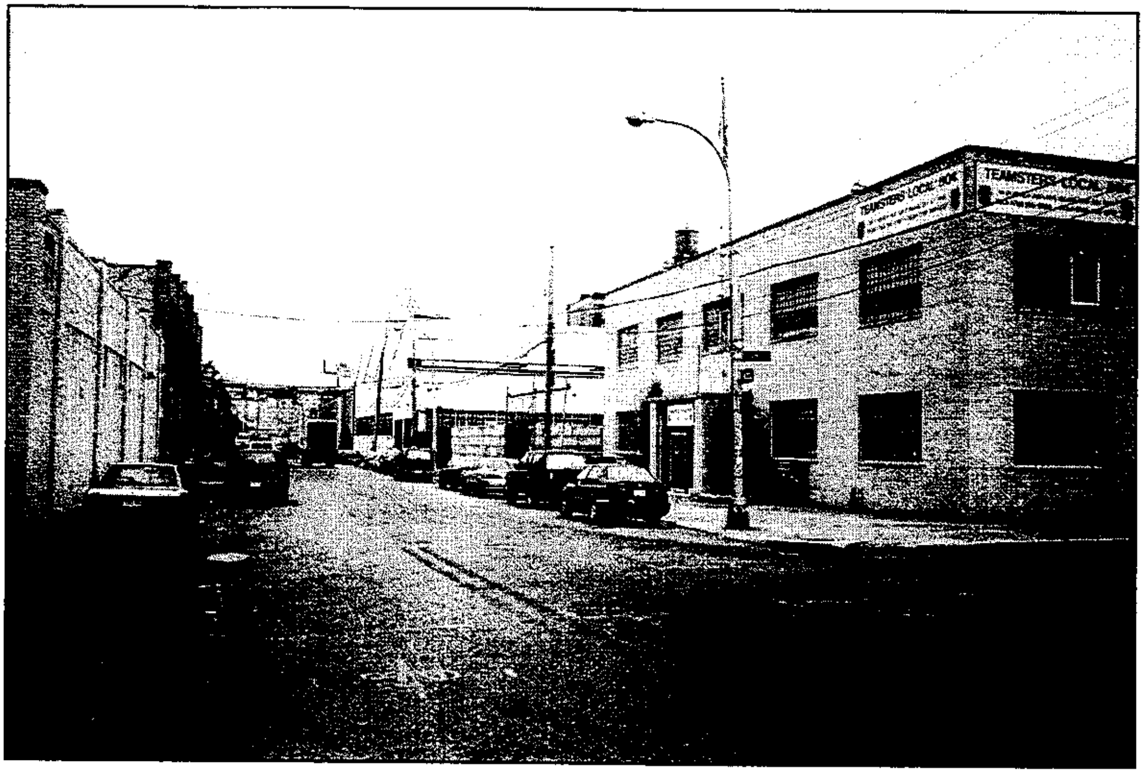
View southeast of Blissville Yard **1**



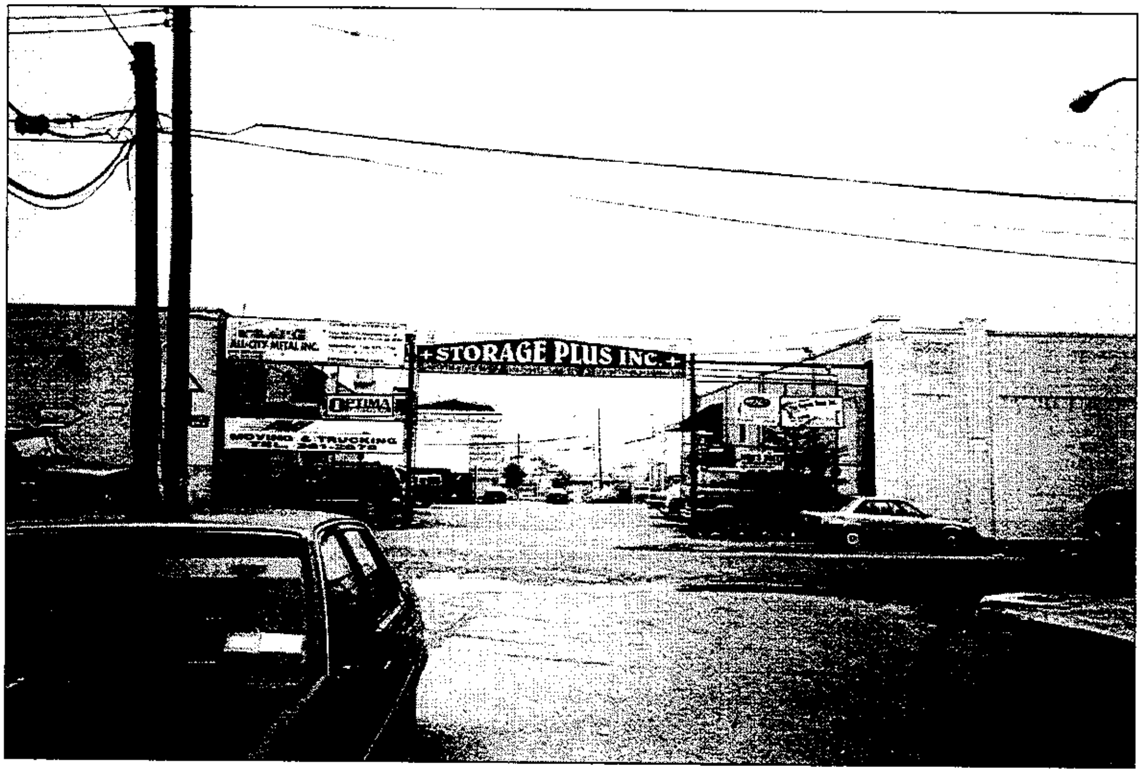
View northwest on service road south of Blissville Yard **2**

Figure 6-16

Blissville Yard – Views of the Study Area



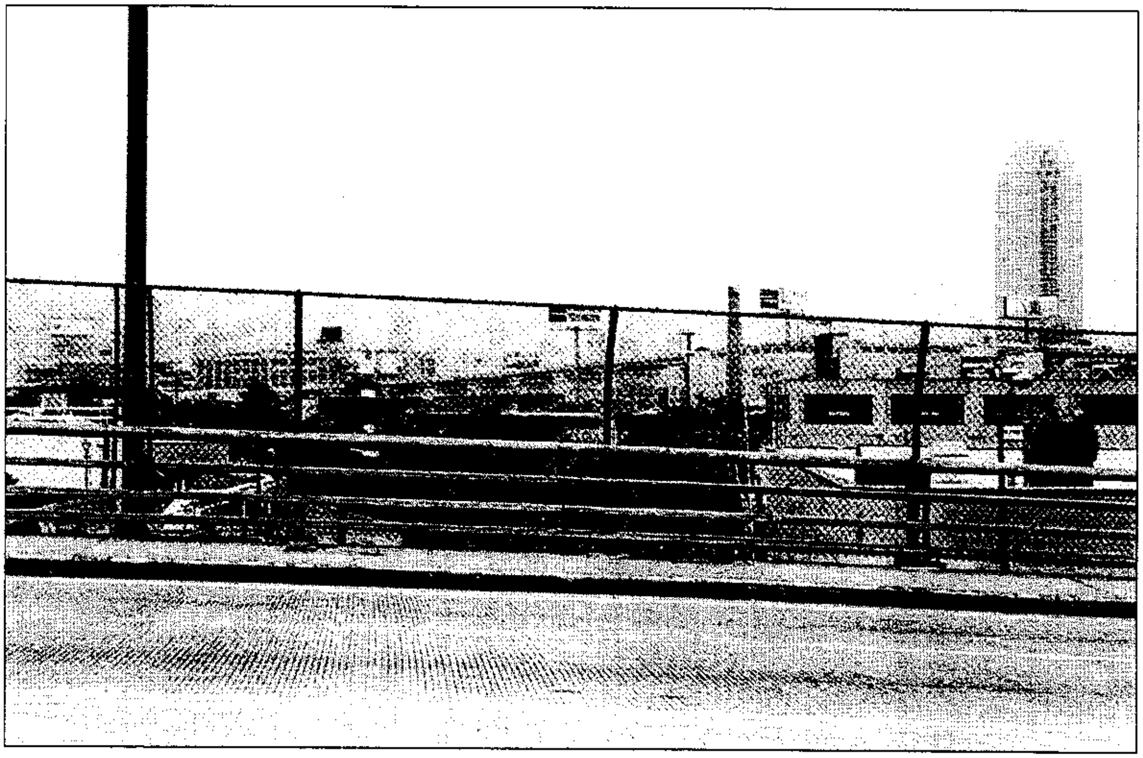
View northwest on Review Avenue from 35th Street **3**



View southwest from 35th Street and Review Avenue **4**

Figure 6-17

Blissville Yard – Views of the Study Area



View west from the JJ Byrne Memorial Bridge **5**

Figure 6-18

Blissville Yard – Views of the Affected Areas

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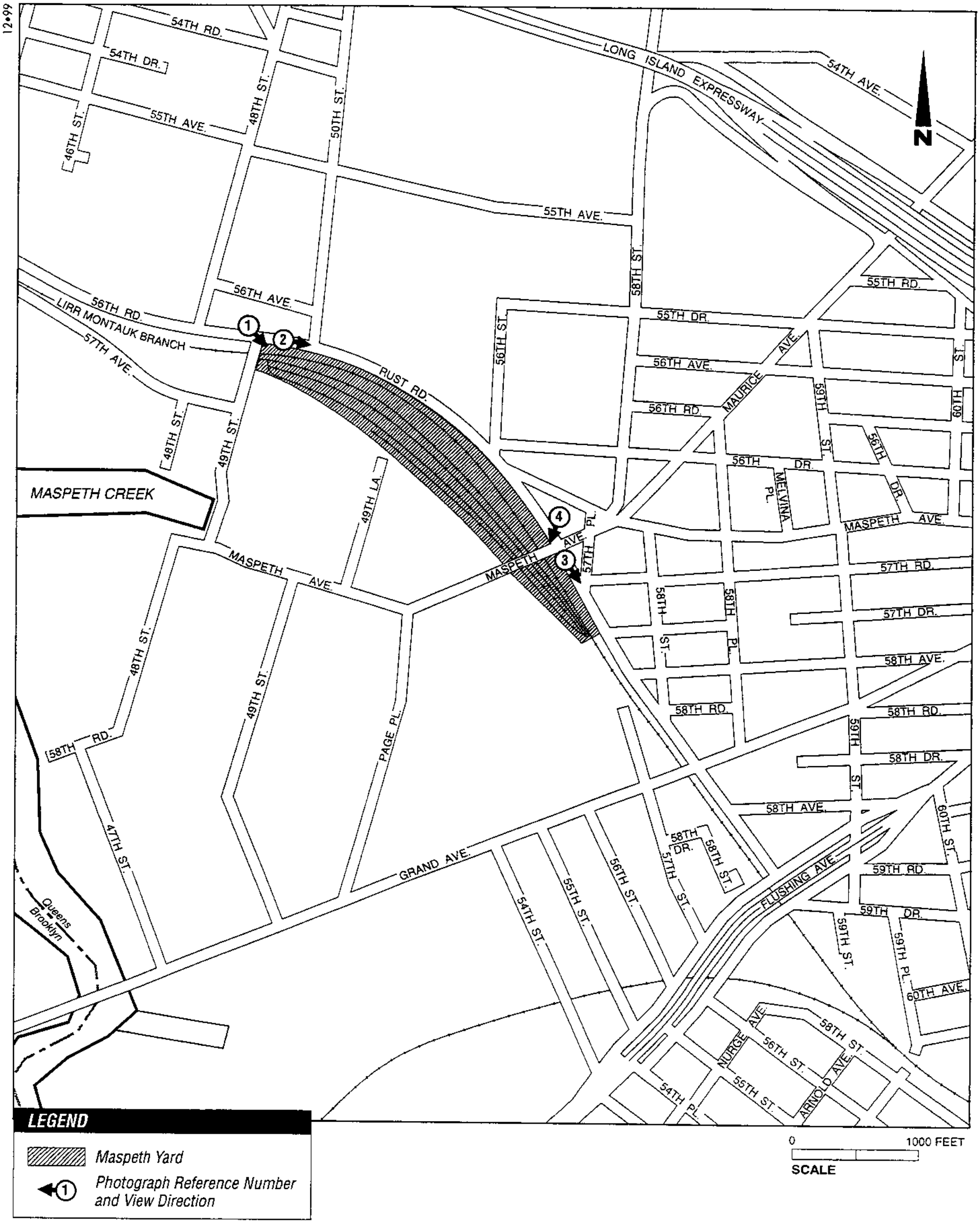
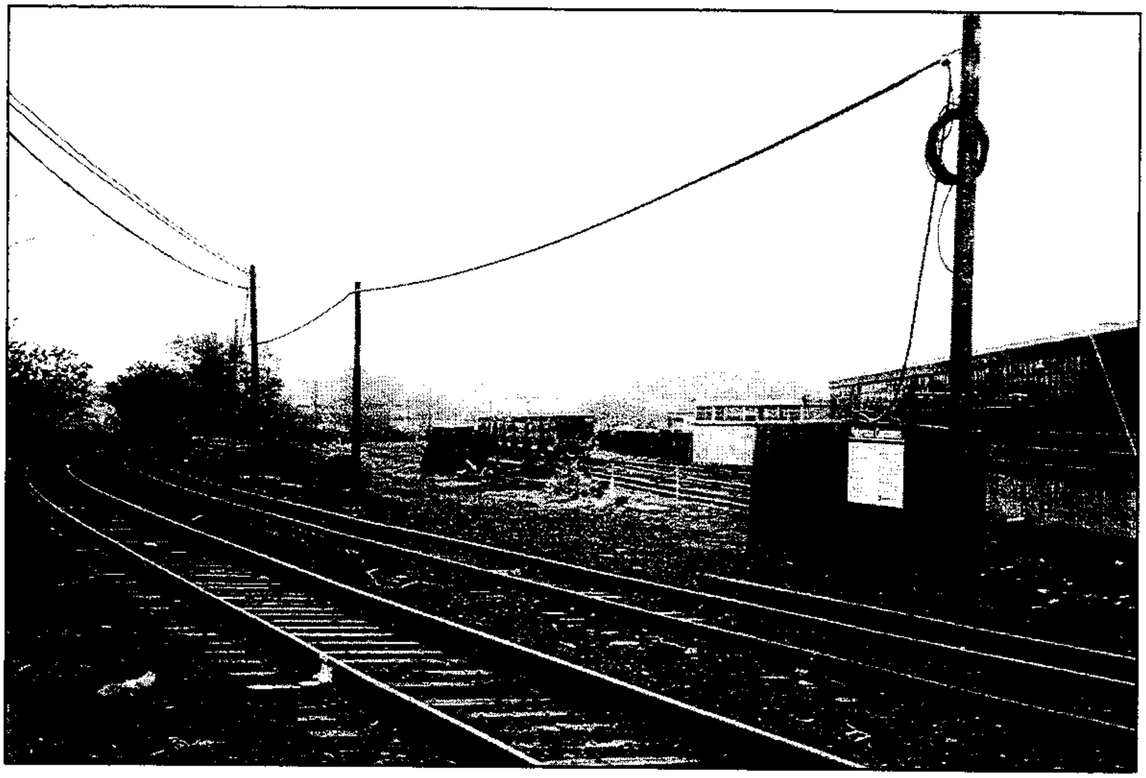


MTA / LIRR

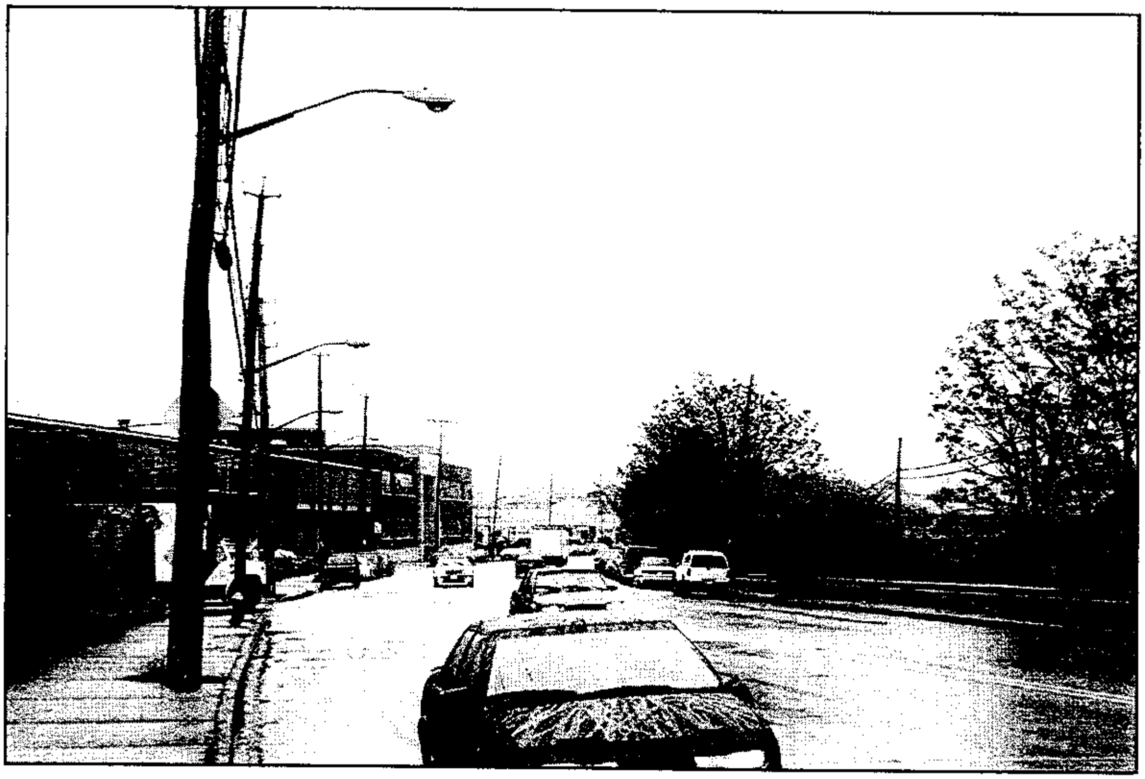
East Side Access

Figure 6-19

Maspeth Yard – Key to Photographs



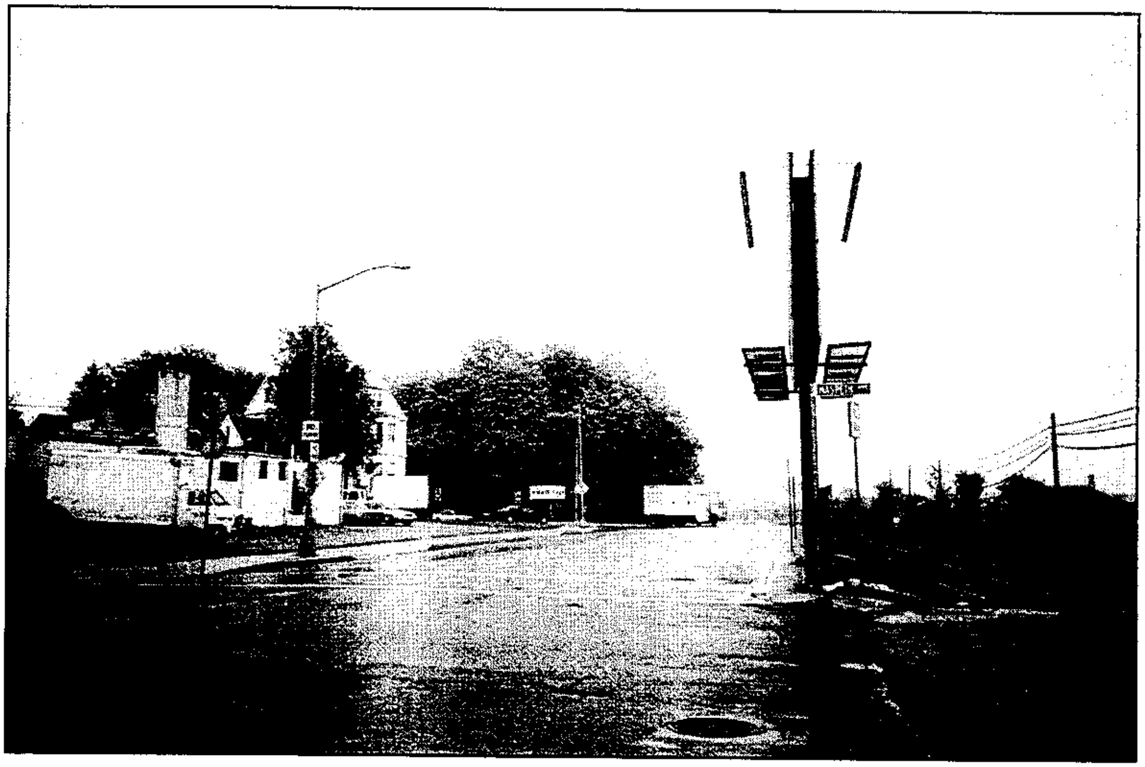
View southeast of Maspeth Yard from 49th Street **1**



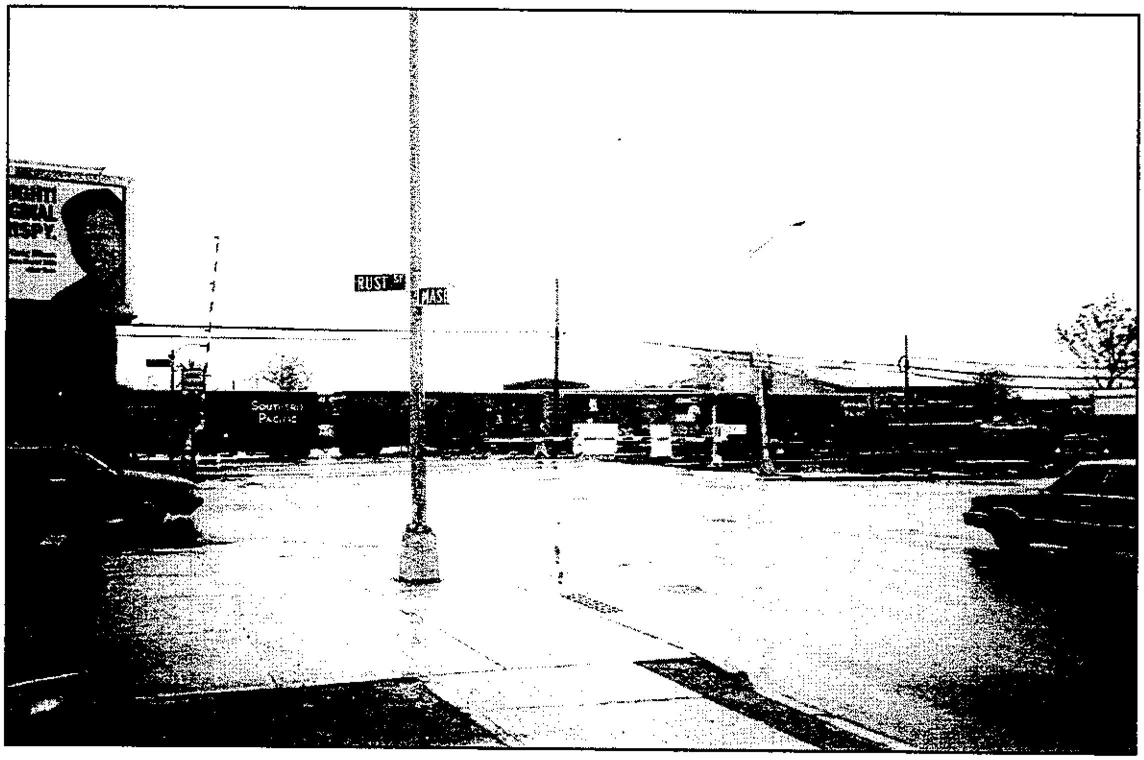
View southeast along Rust Street from 49th Street **2**

Figure 6-20

Maspeth Yard – Views of the Study Area



View southeast on Rust Street from Maspeth Avenue **3**



View west on Maspeth Avenue from Rust Street **4**

Figure 6-21

Maspeth Yard – Views of the Study Area

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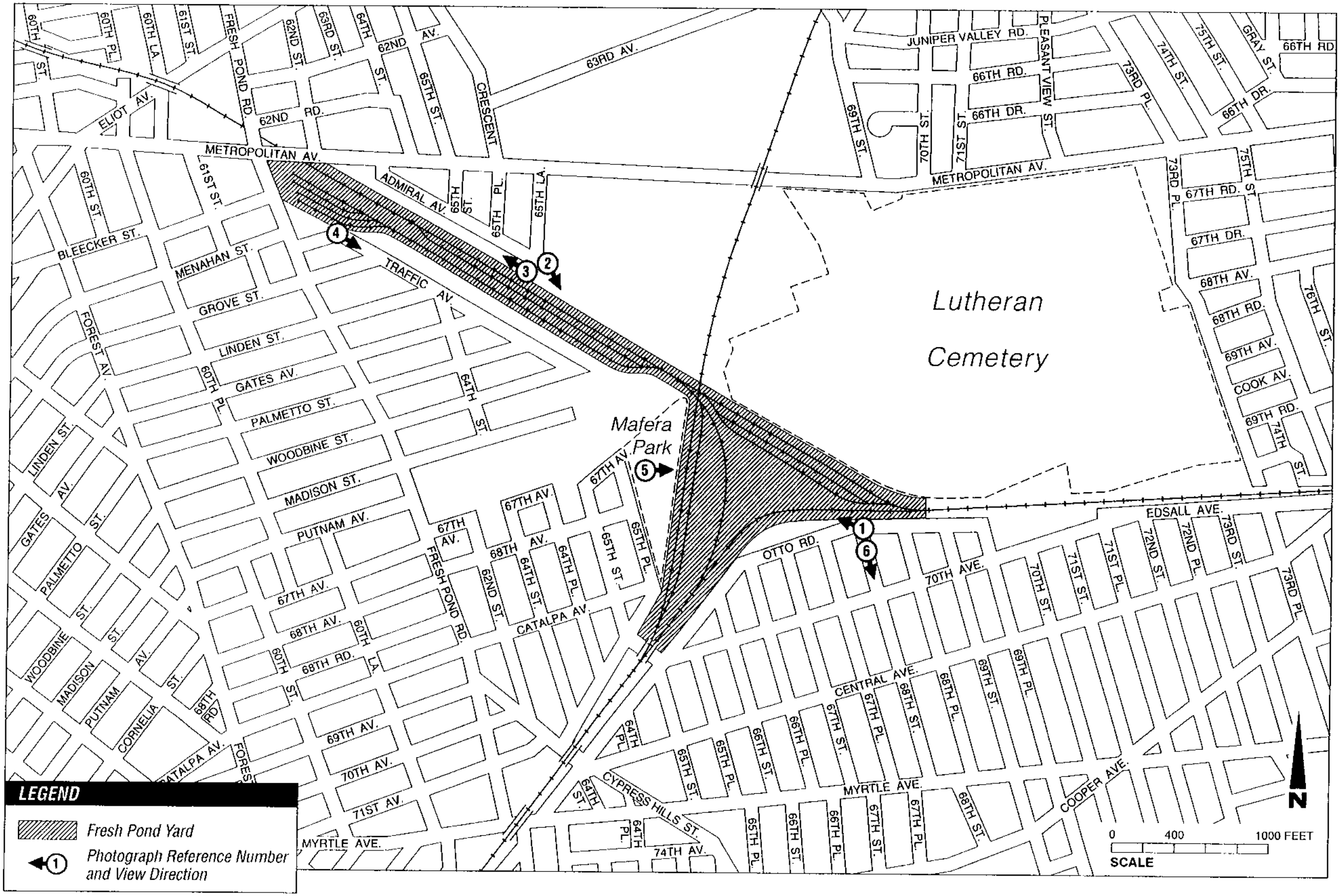
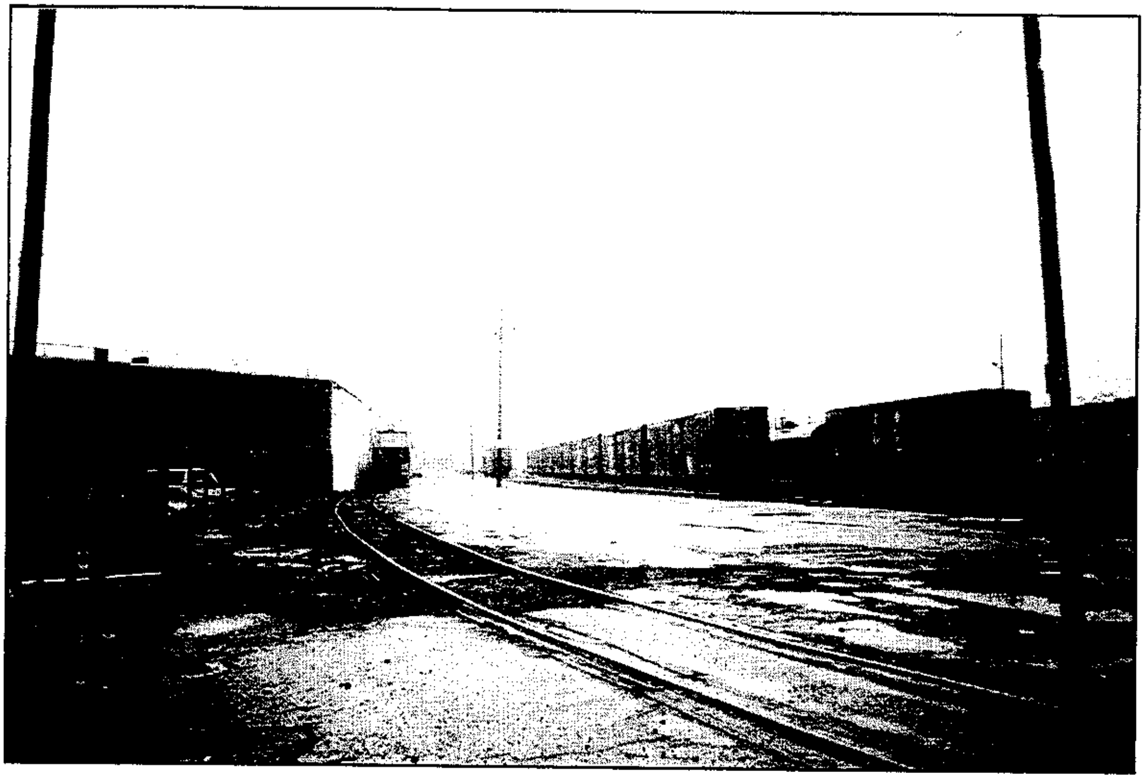
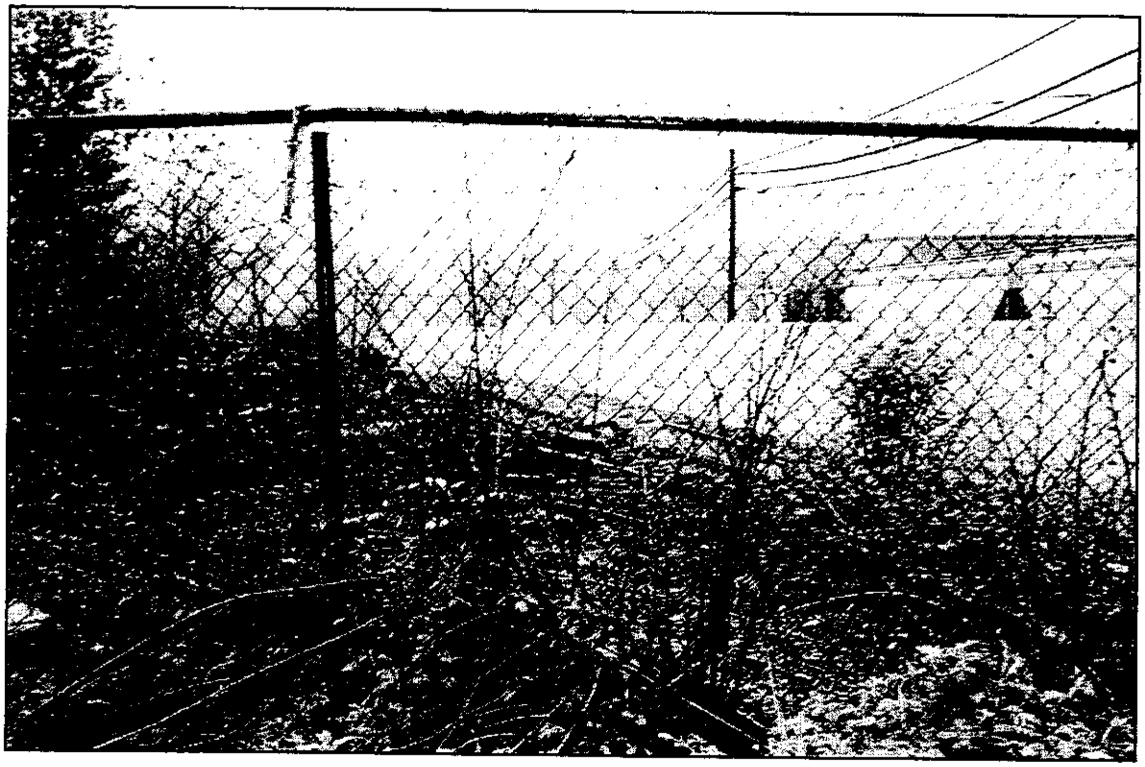


Figure 6-22

Fresh Pond Yard – Key to Photographs



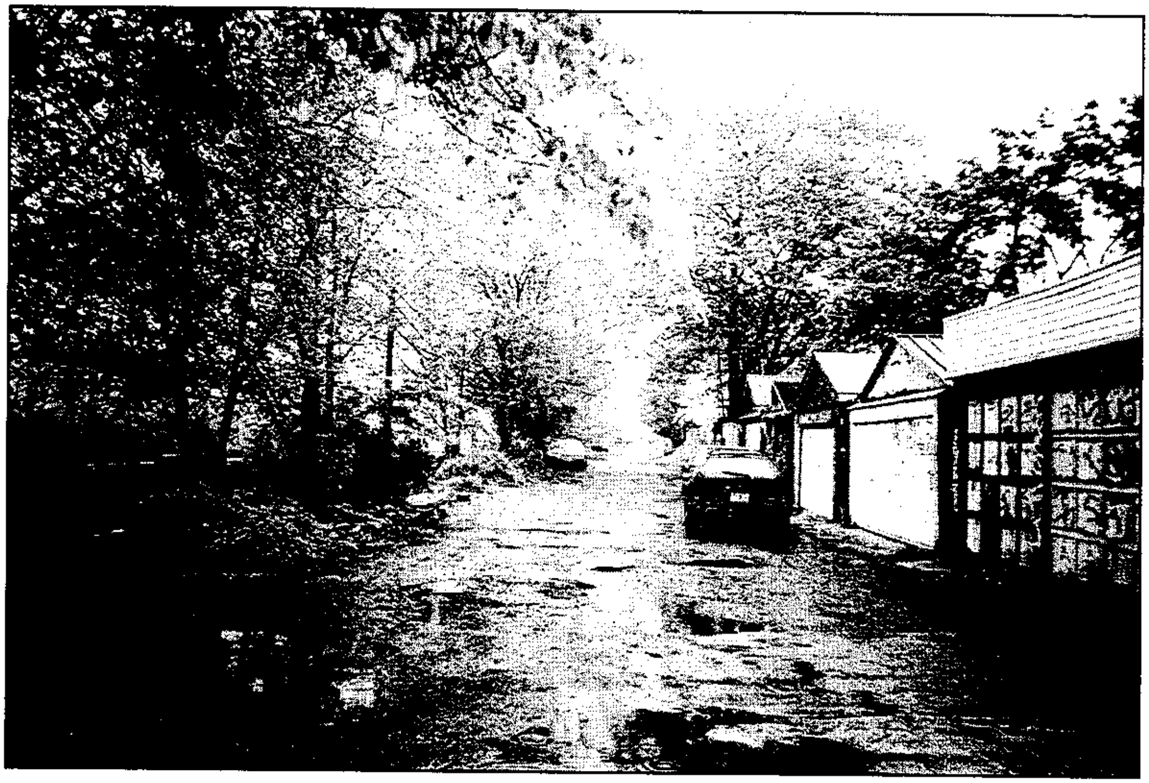
View west of Fresh Pond Yard from 68th Street and Otto Road **1**



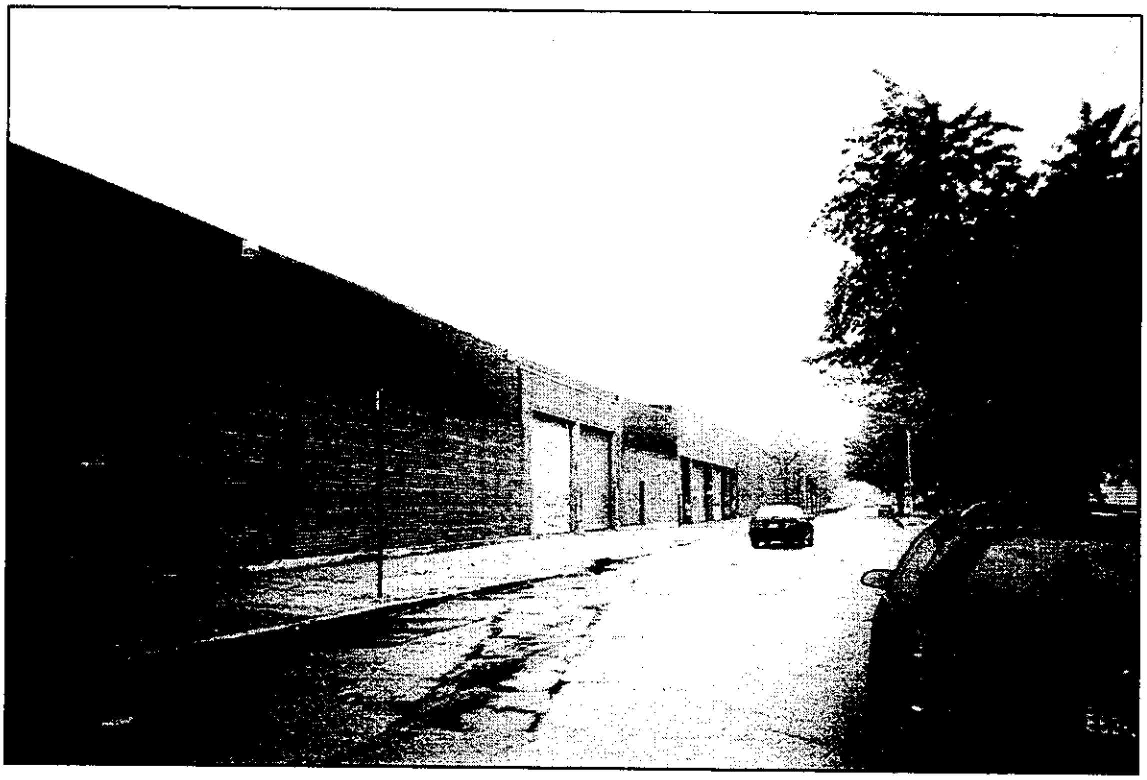
View southeast of Fresh Pond Yard from Admiral Avenue **2**

Figure 6-23

Fresh Pond Yard – Views of the Study Area



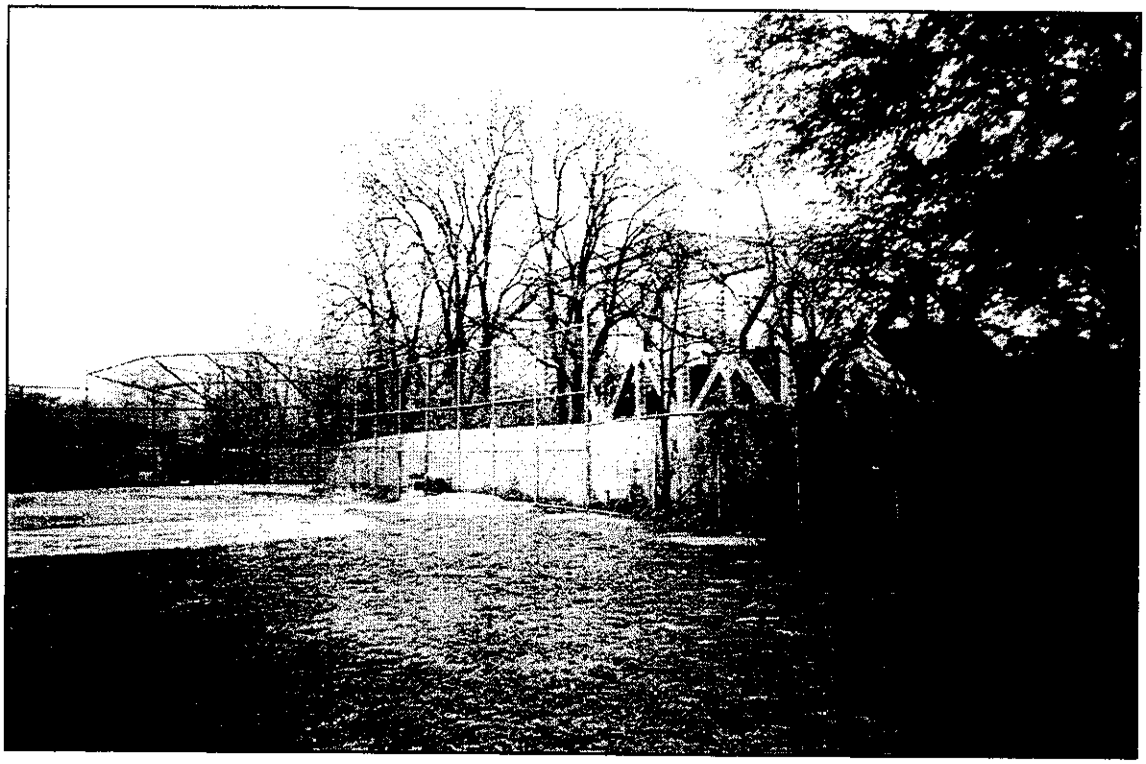
View west along private road south of Admiral Avenue **3**



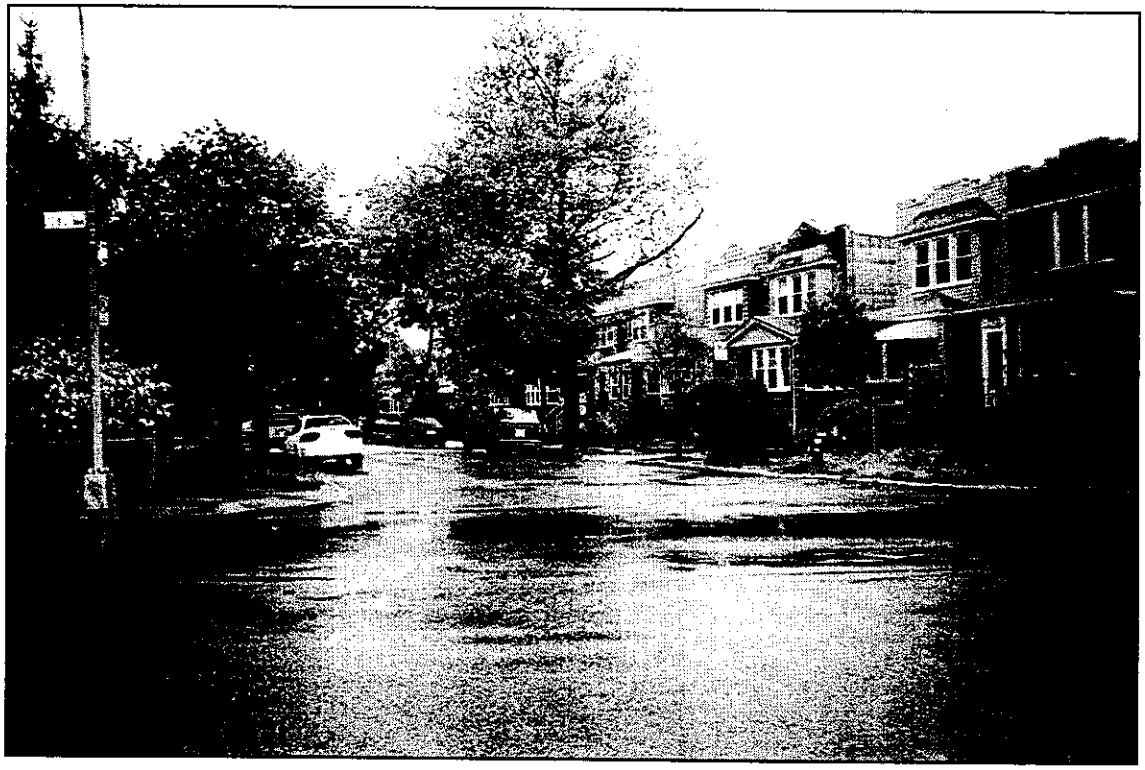
View east on Traffic Avenue from Menahan Street **4**

Figure 6-24

Fresh Pond Yard – Views of the Study Area



View east from Mafera Park **5**



View south on 68th Street from Otto Road **6**

Figure 6-25

Fresh Pond Yard – Views of the Study Area

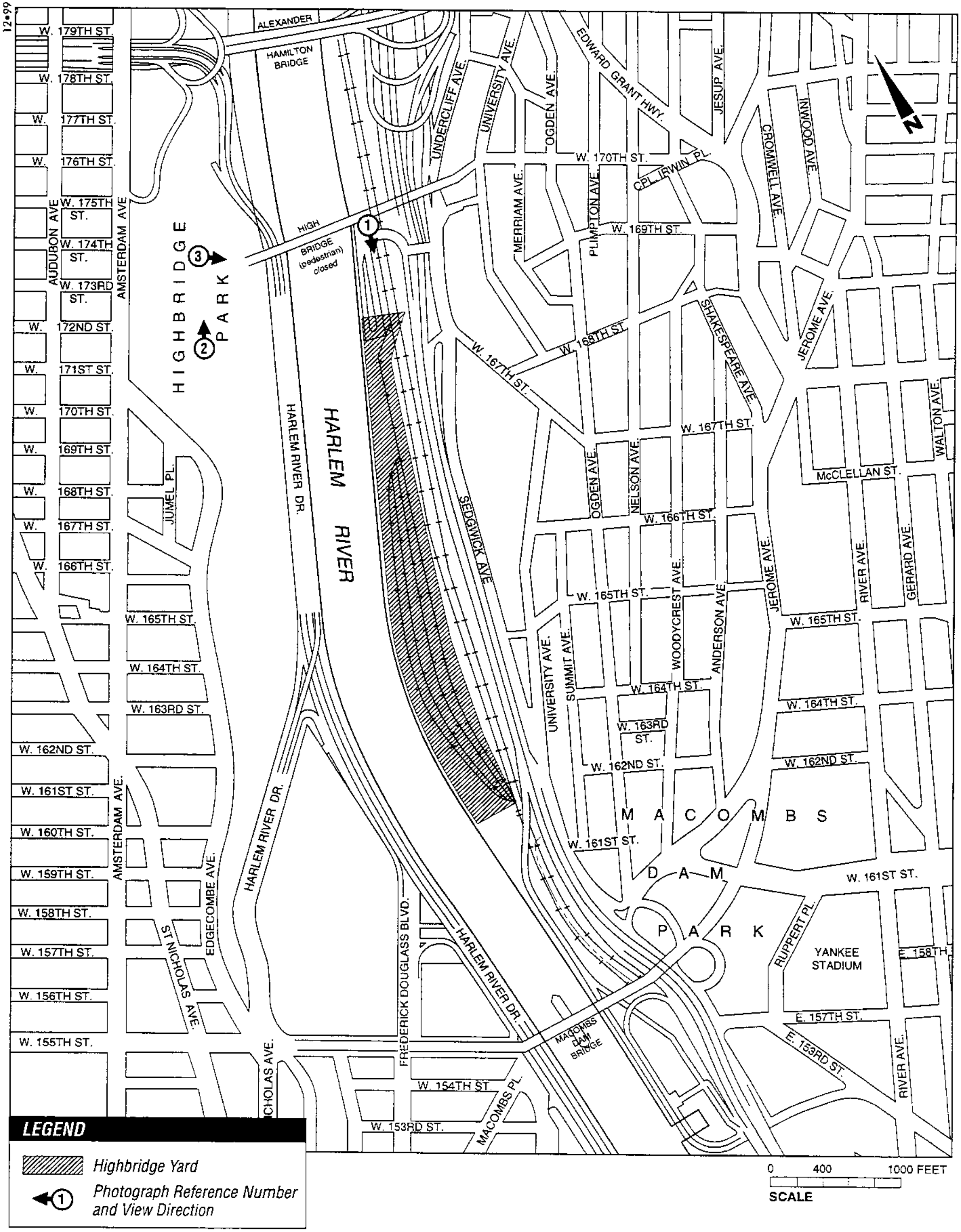
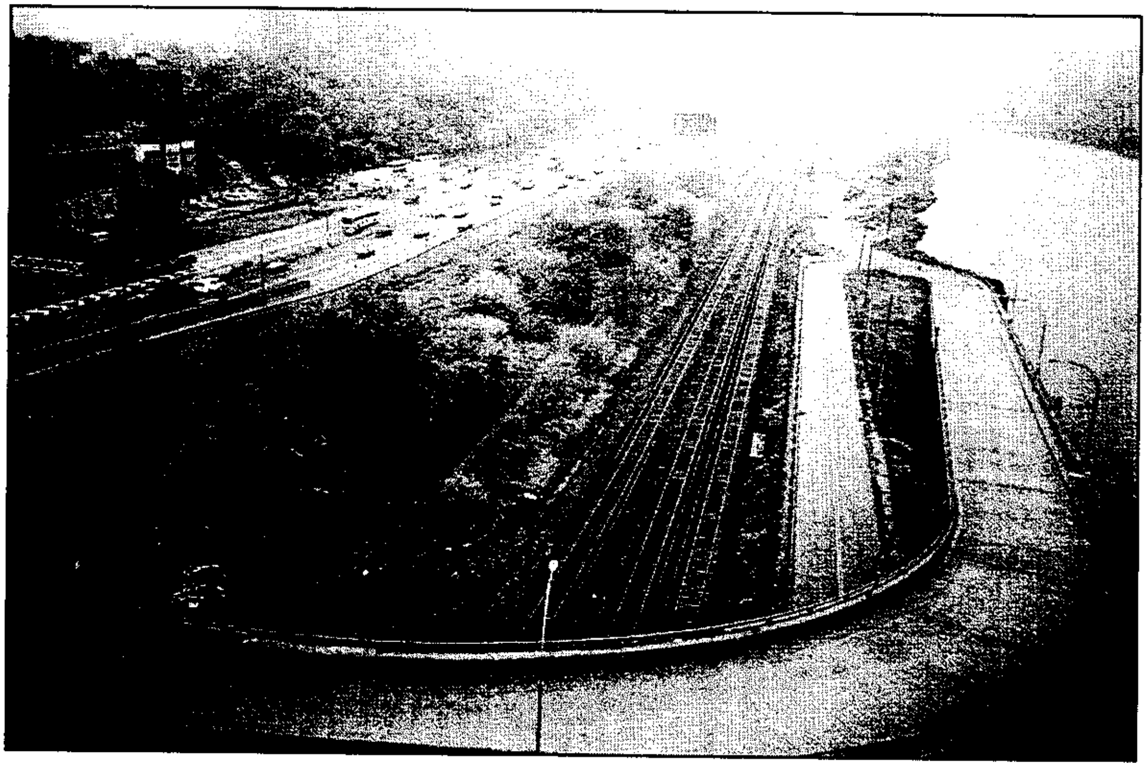
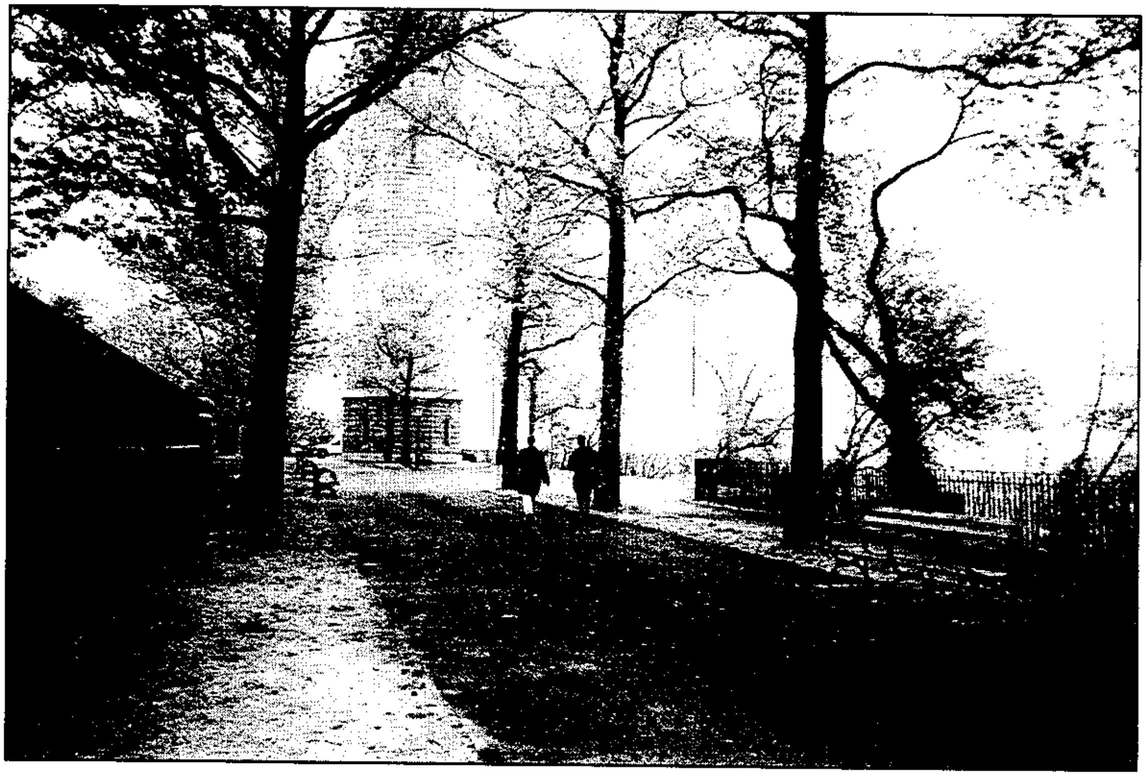


Figure 6-26

Highbridge Yard – Key to Photographs



View south of Highbridge Yard from High Bridge **1**



View north on observation walkway in Highbridge Park **2**

NOTE: ON THE DAY OF THE SITE VISIT, HIGH BRIDGE WAS OPEN TO THE PUBLIC

Figure 6-27

Highbridge Yard – Views of the Study Area

View east from Highbridge Park across the Harlem River **3**

Figure 6-28

Highbridge Yard – Views of the Study Area

Chapter 7: Historic Resources

A. INTRODUCTION AND METHODOLOGY

This chapter assesses the potential impacts to historic resources as a result of construction and/or operation of the project alternatives. Because construction-related impacts to historic structures could be permanent, they are addressed below rather than in Chapter 17, "Construction and Construction Impacts."

Section 106 of the National Historic Preservation Act of 1966 (NHPA), as implemented by federal regulations appearing at 36 CFR Part 800, mandates that federal agencies consider the effect of their actions on any properties listed on or determined eligible for listing on the National Register of Historic Places (NR). Federal agency preservation officers, in consultation with the State Historic Preservation Office (SHPO), must determine whether a proposed action would have any effects on the characteristics of a site that qualify it for the State and National Registers (S/NR). The New York State Historic Preservation Act of 1980 (SHPA) closely resembles NHPA, and requires that state agencies consider the effect of their actions on properties listed on or determined eligible for listing on the State Register of Historic Places.

In general, potential impacts on historic or architectural resources can include both direct physical impacts—demolition, alteration, or damage from construction on nearby sites—and indirect, contextual impacts, such as the isolation of a property from its surrounding environment, or the introduction of visual, audible, or atmospheric elements that are out of character with a property or that alter its setting. Portions of the TSM Alternative that require major construction, and elements of the Preferred Alternative—including new tunnels under buildings on Park Avenue, new Long Island Rail Road (LIRR) pedestrian entrances, work in Grand Central Terminal (GCT), ventilation facilities and substations, and new tunnels and tracks in the Sunnyside Yard area—may affect historic structures.

The No Action Alternative would not be considered an "undertaking"—it involves measures that are available to the LIRR as routine management and do not require a major new construction effort. The No Action Alternative would therefore not result in any significant adverse impacts to historic resources, and it would not require analysis or definition of an Area of Potential Effect (APE).

To assess and compare the potential impacts of the TSM and Preferred Alternatives, an inventory of historic and architectural resources in areas that could be affected by the alternative options was compiled. This chapter includes discussions of the methodology used to prepare the inventory, a brief background history of the area, a description of the identified and potential historic resources, and an assessment of the potential impacts of the project options. This work was prepared in accordance with NHPA, SHPA, and the National Environmental Policy Act (NEPA).

DEFINITION OF THE AREA OF POTENTIAL EFFECT

Areas of Potential Effect (APEs) for the Preferred Alternative were identified in consultation with, and approved by, SHPO in correspondence dated June 21, 1999. They are described below and mapped in Figures 7-1 through 7-6. APEs include locations that may potentially be affected by construction or that may experience effects once construction is completed and the new system is operational.

The APEs defined for the project's Preferred Alternative are as follows:

- For most portions of the project, the APE for construction impacts is the area within 50 feet of major construction elements, including excavation sites, soft ground tunneling, and cut and cover construction.
- Where the effects of construction may extend farther, as when proposed construction would require the underpinning of buildings, the APE is the area within 100 feet from construction activity boundaries, or the entire footprint of the structure, whichever is larger.
- For locations where project elements would be visually prominent, the APE includes the area within 75 feet of the new elements, to ensure that the area within the visual context of the change is covered. This includes any locations where demolition of existing structures is proposed, where an existing building would be physically or visually altered, and any other visually prominent project elements.
- In areas where proposed work is not anticipated to have physical or contextual (e.g., visual) effects outside the limits of the proposed work, the APE is the area within the confines of proposed work at GCT or within the boundaries of affected rail yards. This includes surface trackwork, construction within GCT not visible to the public, and work within existing railroad yards (including Yard A, Sunnyside Yard, and the smaller yards that would be affected by the project—Blissville, Maspeth, and Fresh Pond Yards in Queens and Highbridge Yard in the Bronx).
- For work within GCT that would be visible to the public, the APE is the area within visual range of any proposed changes within the terminal itself.

Where no impacts are anticipated, no APEs have been defined. Once the project is completed and operational, there would be no difference in the visual characteristics above-grade for soft ground tunneling, cut and cover sections, or underpinned buildings. Therefore, no APE for operations has been defined for visual or contextual concerns for these types of construction. In addition, no APE has been defined for construction impacts or operational impacts where the existing 63rd Street tunnel would be used or areas where deep tunneling would take place. As described in detail in Chapter 11, "Noise and Vibration," vibrations due to construction and/or operation of the project would not be expected to result in any impacts to structures near an existing tunnel or where hard rock tunneling would be used. Thus, there is no APE related to construction or to operation of new service for the existing 63rd Street tunnel or for the portion of tunnel in Manhattan leading to GCT (north of 55th Street).

For the TSM Alternative, APEs have been defined only for elements that would require construction and could affect known or potential historic resources. APEs have been determined using the same methodology as described above for the Preferred Alternative. Project elements that would require major construction would be visible, and, therefore, an area within 75 feet of the construction activity boundaries has been determined as the APE for the following project

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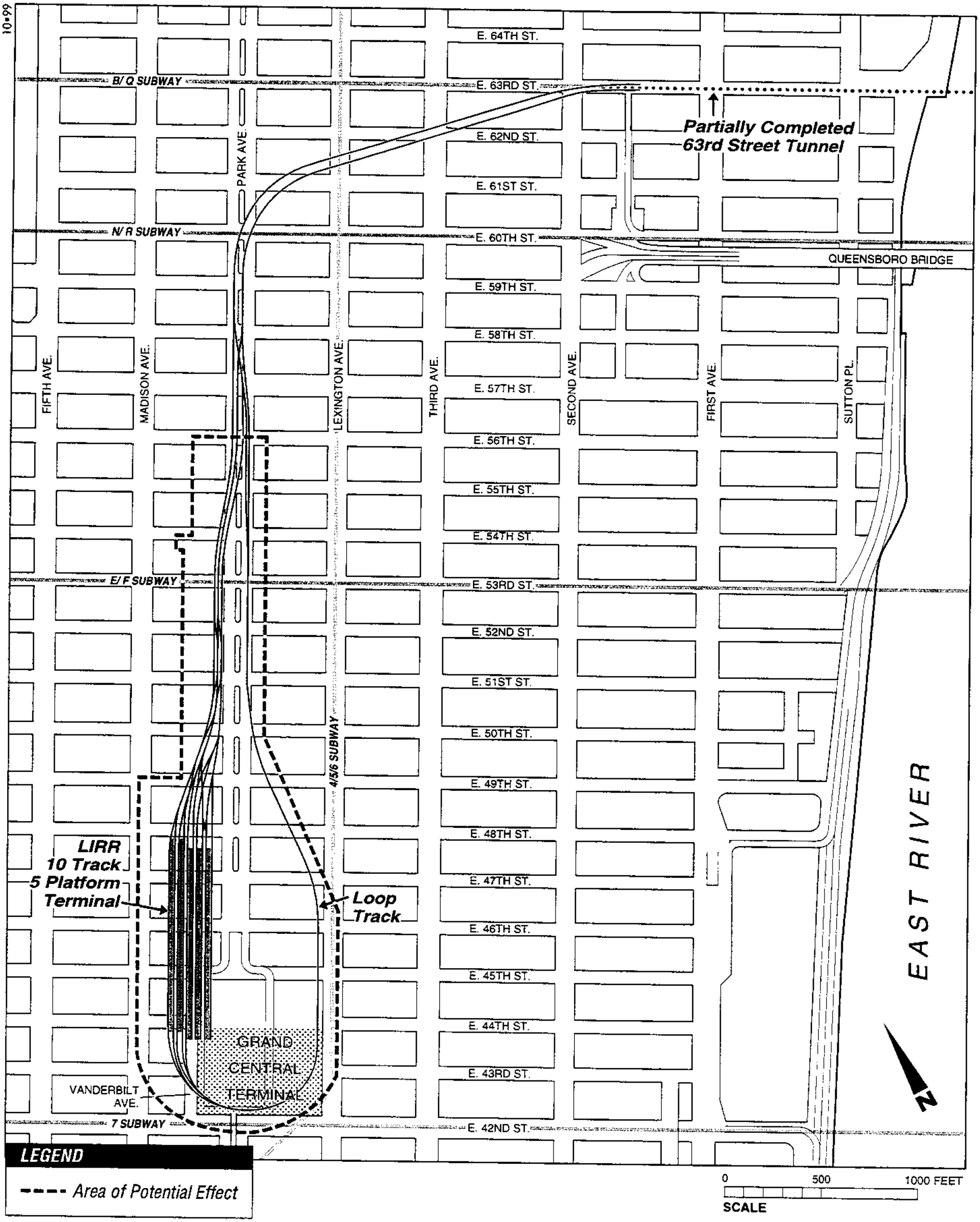

MTA / LIRR
East Side Access

Figure 7-1

Manhattan Alignment and Area of Potential Effect – Historic Resources

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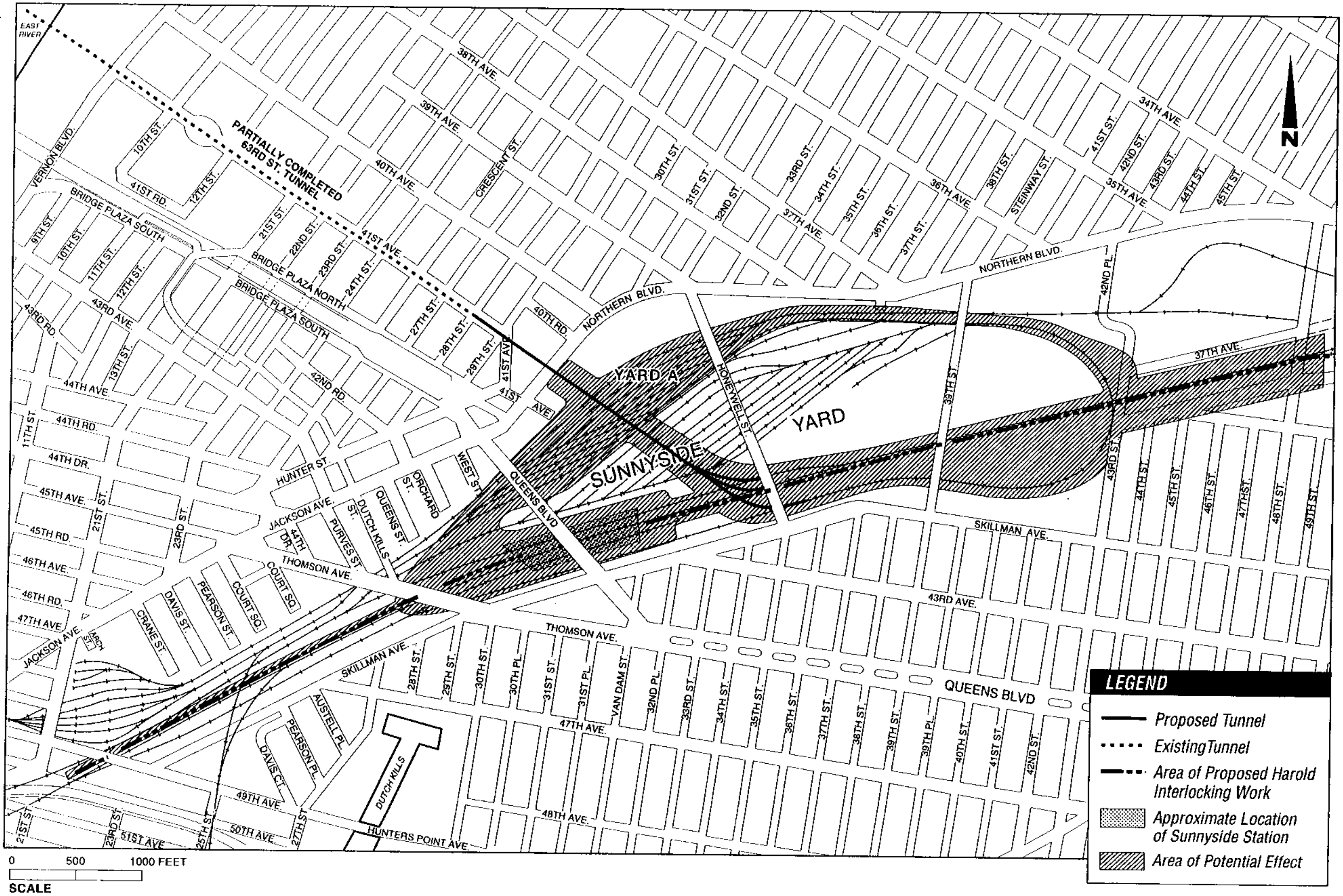

MTA / LIRR

East Side Access

Figure 7-2

Queens Alignment and Area of Potential Effect – Historic Resources

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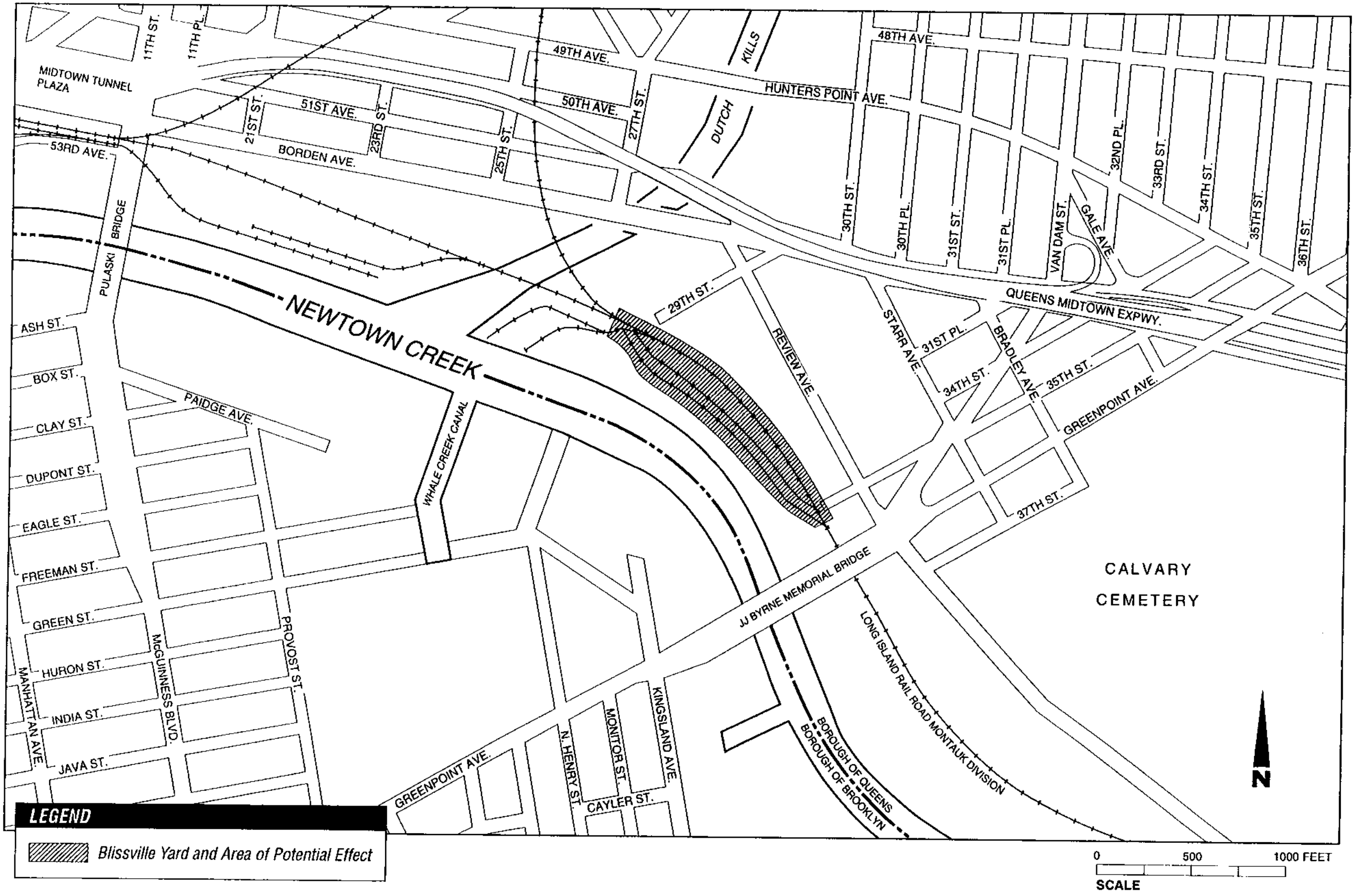
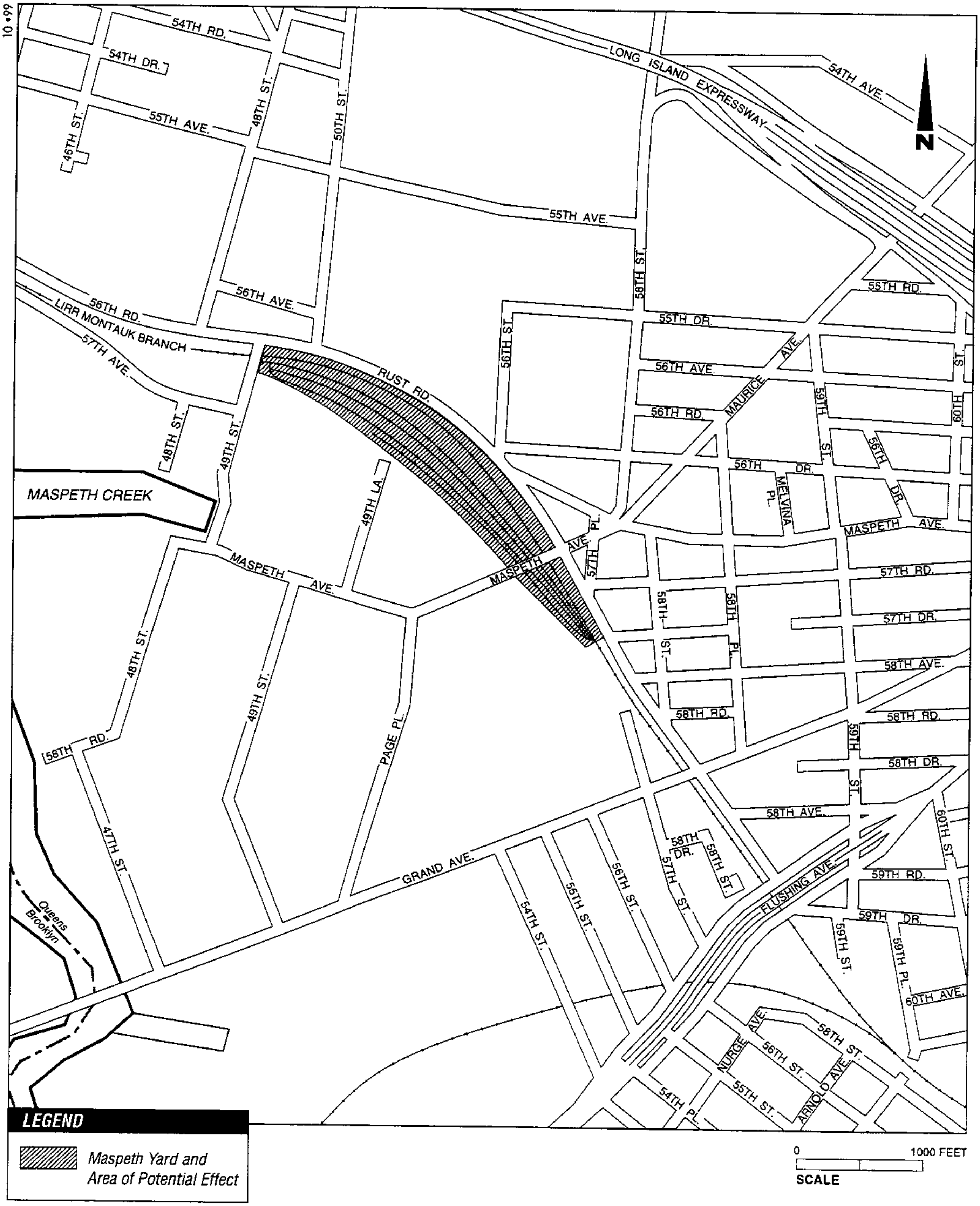


Figure 7-3

Blissville Yard and Area of Potential Effect – Historic Resources



MTA / LIRR
East Side Access

Figure 7-4

Maspeth Yard and Area of Potential Effect – Historic Resources

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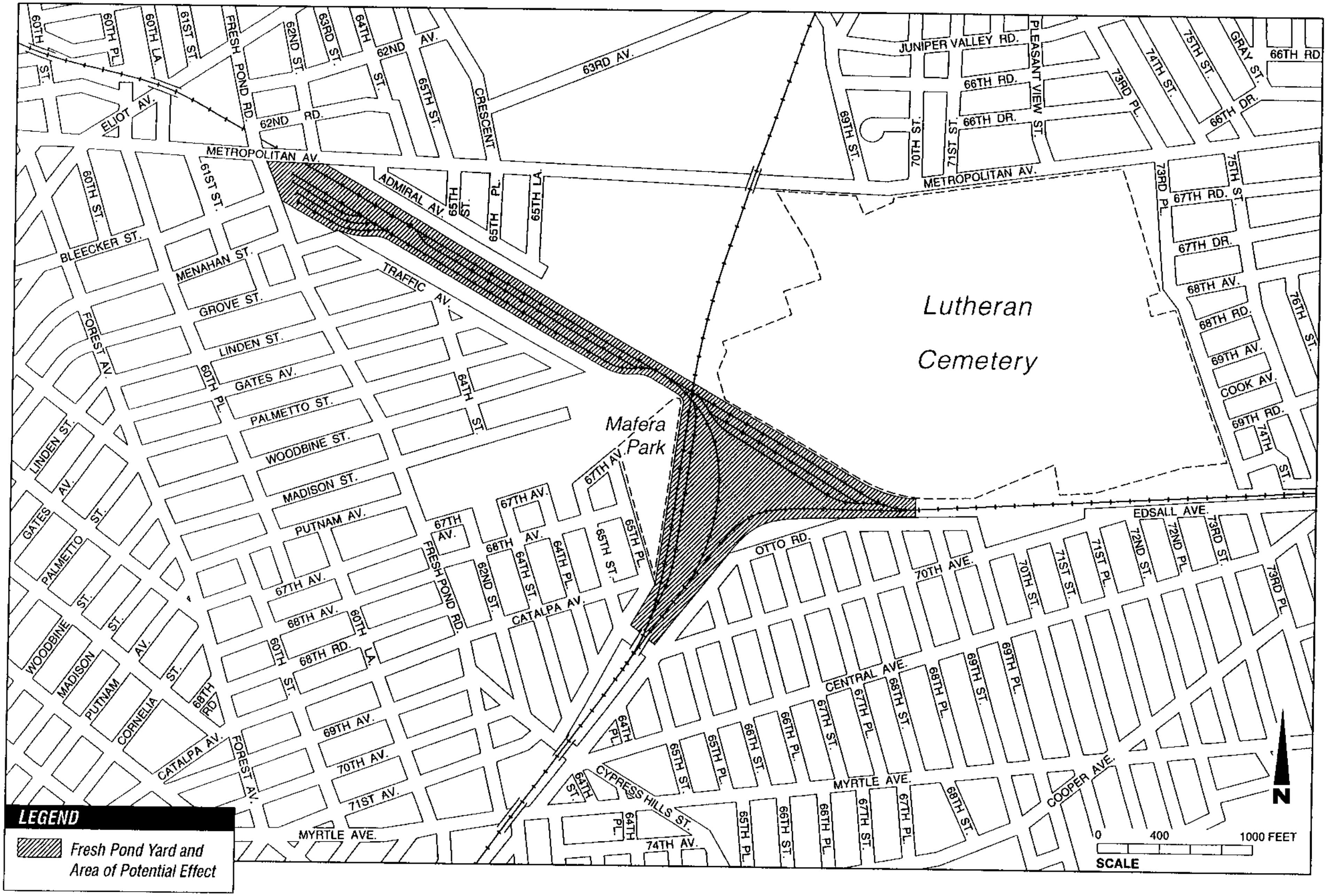

Figure 7-5

Fresh Pond Yard and Area of Potential Effect – Historic Resources elements: construction of a pedestrian bridge connecting the LIRR and subway stations at the Hunters Point Avenue bridge, a new flyover ramp and on ramp within the LIE right-of-way, creation of a new covered pedestrian walkway between the Long Island City station and East River ferry terminal, and enlargement of a ferry slip at the terminal (see Figures 2-1 and 2-2 in Chapter 2, "Project Alternatives" for project element locations).

INVENTORY OF HISTORIC PROPERTIES/STRUCTURES WITHIN THE APES

Once the APEs were determined, a list of officially recognized historic resources within the APEs was compiled. This includes properties or districts listed on the S/NR or determined eligible for such listing; National Historic Landmarks (NHL); New York City Landmarks and Historic Districts (NYCL), and properties that have been considered for designation ("heard") by the New York City Landmarks Preservation Commission (LPC) at a public hearing or calendared for consideration at such a hearing (these are "pending" NYCLs).

A list of potential historic resources within the APEs was also compiled. These were identified based on field surveys of the APEs and by using sources listed at the end of this chapter. Potential historic resources comprise properties that may be eligible for listing on the S/NR and/or designation as NYCLs. Criteria for listing on the National Register are found in the *Code of Federal Regulations, Title 36, Part 60.* These criteria are as follows.

Districts, sites, buildings, structures, and objects are eligible for the Registers if they possess integrity of location, design, setting, materials, workmanship, feeling, and association, and:

- Are associated with historic events;
- Are associated with significant people;
- Embody distinctive characteristics of a type, period, or method of construction, represent the work of a master, possess high artistic value, or are otherwise distinguished; or
- May yield information important in prehistory or history.

Properties that have achieved significance within the last 50 years are ordinarily not eligible. Determinations of eligibility are made by SHPO.

In addition, LPC designates historically significant properties in New York City as New York City Landmarks and/or Historic Districts, following the criteria provided in the *Local Laws of the City of New York, New York City Charter, Administrative Code, Title 25, Chapter 3.* Buildings, properties, or objects are eligible for landmark status when a part is at least 30 years old. Landmarks have a special character or special historical or aesthetic interest or value as part of the development, heritage or cultural characteristics of the city, state or nation. There are four types of landmarks: individual landmark, interior landmark, historic district, and scenic landmark. MTA's transportation facilities are exempt from local laws and ordinances pursuant to Public Authorities Law Section 1266, Subdivision 8. MTA nevertheless intends to continue to seek the advice and counsel of the New York City Landmarks Preservation commission as it goes forward in the same manner as it has in the past. As MTA's plans develop, MTA anticipates that it will submit to LPC information regarding the project, and would expect that LPC, if it so chooses, would hold a public hearing and issue a report on MTA's plans in the manner that LPC issues reports with respect to city-owned properties.

Properties in the project's APEs that appear to meet one or more of the Register criteria were identified as potential historic resources. For each of these properties, New York State Building-Structure Inventory forms ("Blue forms") were submitted to SHPO for evaluation and determination of whether SHPO considers the properties to be eligible for the Registers. SHPO has subsequently made determinations of eligibility for many of these resources. Copies of these findings are included in the appendix.

Known historic resources, potential resources identified by SHPO for this project as eligible for listing on the S/NR, and potential resources pending SHPO determination of eligibility are identified and described below in section C, "Existing Conditions."

POTENTIAL IMPACTS ON HISTORIC RESOURCES

Once the historic resources in the APEs were identified, the impacts of the project on those resources were assessed. As described above, project impacts on known historic resources, those potential resources determined by SHPO to meet eligibility criteria for listing on the S/NR, and potential resources pending SHPO determination of eligibility identified in this chapter may include both physical impacts and contextual impacts. Direct impacts could include physical destruction, demolition, damage, or alteration of a historic resource. In addition, visual impacts, such as changes in the appearance of a historic resource or in its setting—including introduction of incompatible visual, audible, or atmospheric elements to a resource's setting, or elimination of publicly accessible views to the resource—are also considered. Project-related impacts, including impacts during construction and impacts during operation once the project is completed, are described below in section E, "Probable Impacts of the Project Alternatives."

B. BACKGROUND HISTORY

MANHATTAN

In 1832, the New York and Harlem Railroad opened the first railroad in New York City, its horse-drawn "street railroad" on Fourth Avenue (now Park Avenue) between Union Square and 23rd Street. At this time, the City of New York extended from the Battery to as far north as approximately 8th Street, with a population of around a quarter of a million. To the north, the hilly terrain of Manhattan was largely undeveloped, although small settlements were located to the north, including the village of Harlem. Construction of the railroad stimulated development northward as people moved to less congested areas of the city within commutable distance to the commercial areas of Wall Street and the City Hall area.

In 1837, the railroad was converted to steam-powered rail service and extended along Fourth Avenue to 125th Street in Harlem. The railroad depot was located at Fourth Avenue between 26th and 27th Streets. In 1842, the use of steam power was outlawed south of 32nd Street, since the area was well settled. This part of Park Avenue was built up primarily with 3- to 4-story residential buildings with shops on the ground floor, with some churches, hotels, and finer homes located along the avenue. In the early 1850's, the street cut in Park Avenue south of 42nd Street was bridged and subsequently turned into a railroad tunnel, an arched brick structure which still runs beneath Park Avenue and now carries automobile traffic.

North of 42nd Street, the character of the neighborhood was quite different. Park Avenue north of 42nd Street was one of the more unappealing streets in New York. Open railroad tracks and switching yards ran down the center between factories, garbage dumps, and stockyards on either side. A brewery stood on the site now occupied by St. Bartholomew's Church and the site of the

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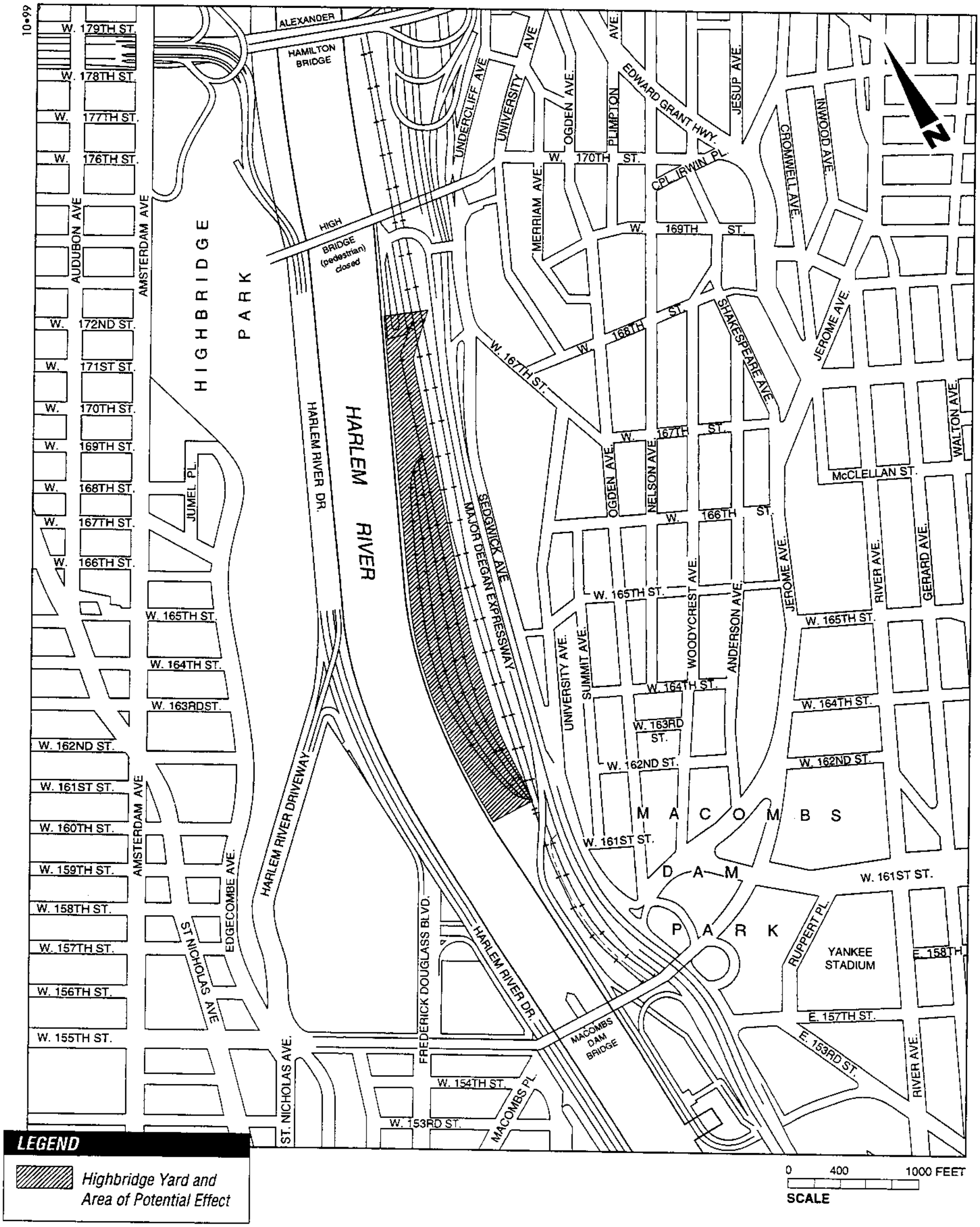


Figure 7-6

Highbridge Yard and Area of Potential Effect – Historic Resources

Waldorf-Astoria Hotel was formerly a potter's field. Residential development was sparse since residents were fearful of moving north of Murray Hill to areas consisting of shanty towns, slaughterhouses, and charitable institutions. Later, large institutions located along Park Avenue, including Columbia College at 49th Street (built in 1857), Normal College for Girls (now Hunter College) built in 1873, and the Seventh Regiment Armory erected in 1880.

By 1869, Cornelius Vanderbilt consolidated the New York and Harlem Railroad and the New York and Hudson River Railroad to form the New York Central and Hudson River Railroad. He commissioned architect John B. Snook to design Grand Central Depot, which opened in 1871 at Park Avenue and 42nd Street. The proposed site was already occupied by railroad buildings, including two locomotive houses, a depot, a carhouse and stables located along Fourth Avenue between 42nd and 44th Streets. The new station proved to be inefficient and in a constant state of rearrangement, due to such shortcomings as trains only being able to exit the depot in reverse. Shortly after its completion, the tracks in Park Avenue between the station and 56th Street were depressed below street level in a deep cut and roofed over. They were subsequently enclosed within a tunnel that ran from 57th Street to 96th Street.

By 1889, the city demanded that railroads electrify operations, and a proposal to erect a new depot was made by William Wilgus, the chief engineer of the New York Central and Hudson River Railroad, who was responsible for the submerging of tracks and electrification of the railroad lines. A limited competition was held and won by the architectural firms of Reed & Stem and Warren & Wetmore, which devised a system for separating automobile, pedestrian, train, and subway traffic by using ramps to route Park Avenue around the new terminal, which was completed in 1913, with the viaduct finished in 1919. The construction of the new GCT, its accompanying facilities, and tracks necessitated the demolition of approximately 200 buildings.

Wilgus proposed a novel plan to raise revenues for construction of the new depot—by selling and leasing the air rights over the tracks between Madison and Lexington Avenues from 42nd to 50th Streets (and including the west blockfronts on Park Avenue between 50th and 52nd Street) to allow for construction of revenue-producing office and apartment buildings. The railroad set up a subsidiary company to take care of rentals and its other real estate business, and development of the newly available real estate began prior to completion of the terminal building. In the January 25, 1913 *Harper's Weekly*, the railroad placed an ad entitled "The Terminal City," which described GCT and corresponding development on the covered tracks as a "great Terminal City, a city within a city." By the time it was fully developed in the late 1920's, this 48-acre terminal area, which became known as Terminal City, had a post office; eight major luxury hotels, including the Waldorf-Astoria, Roosevelt Hotel, and Barclay Hotel (now the Hotel Intercontinental); 11 office buildings, including the New York Central Building, Postum Building at 250 Park Avenue, Graybar Building, Vanderbilt Concourse and Vanderbilt Office buildings; six large luxury apartment buildings; and the Yale Club. Though designed by several architectural firms—including Warren & Wetmore, joint architects with Reed & Stem of GCT—these buildings were tall, typically built of brick with stone bases, and shared a common aesthetic of Classical and Renaissance detailing. By covering the tracks between 42nd and 52nd Streets, the railroad had returned 30 blocks of prime land for development and recouped a large portion of its investment. It also paved the way for the creation of Park Avenue as one of the most prestigious residential districts in the nation.

Terminal City was a unique and progressive attempt at creating a planned sector within the city on such an ambitious scale and with an integrated design—it remained unmatched until the design and construction of Rockefeller Center (1931-40), which borrowed many of Terminal

City's design elements. Further, at the core of the development was the vision of Park Avenue as a grand boulevard, which was transformed from a railroad corridor to a tree-lined avenue with a planted central mall. The development of Terminal City served to create a new fashionable district, which was further augmented by the construction of luxury elevator apartment buildings to the north along Park Avenue. With the office boom of the 1950's and 1960's, many of the masonry apartment buildings on Park Avenue south of 59th Street were replaced with steel and glass office buildings of curtain wall design pioneered by Lever House, built in 1950-52.

SUNNYSIDE YARD, QUEENS

Sunnyside Yard was built by the Pennsylvania Railroad and opened in 1910, with Long Island Rail Road service commencing in September and Pennsylvania Railroad service in November of that year. Prior to construction of the yard, the area first consisted of farms that were subdivided during the 1880's and 1890's. By 1891, more than 100 small frame and brick houses had been built on the site of the future Sunnyside Yard, including a small hamlet, Sunnyside, built between Northern and Queens Boulevards. By 1903, many houses filled the future yard site on the blocks from 32nd to 43rd Streets and between Skillman Avenue and Northern Boulevard. Most of the land in the area was low-lying and boggy, and therefore cheap. By 1901, the Pennsylvania Railroad had made the decision to build tunnels from New Jersey to Manhattan and over to Long Island City and to build a large railroad yard in the Sunnyside area. The New York Tunnel Extension, as the project was named, had the primary goal of providing an all-rail line to a centrally located station in New York City and replacing the existing terminal in Jersey City, which was only reached from New York by ferries. In 1910, the Pennsylvania Railroad opened tunnels under the East River, culminating a decade-long modernization program for the Long Island Rail Road (in 1900 the Pennsylvania Railroad had acquired a majority of LIRR stock) which included the electrification of LIRR lines in Queens, erection of a large coal-fired power plant in Hunters Point, and completion of McKim, Mead, & White's New York Pennsylvania Station (now demolished).

Between 1902 and 1905, the railroad gradually bought up all the land south of Northern Boulevard between 21st and 43rd Streets. In 1907, it began leveling the area, including an entire 200-acre hill, and filling in the low-lying meadow and swamp land. By the time the work was completed in 1908, more than 250 acres of former tidal marsh had been filled in. Approximately 52 streets were demapped and the railroad purchased and subsequently demolished around 400 structures located on the Sunnyside Yard tract. In 1909, the viaduct bridges were built over the yard—at Hunters Point Avenue, Thomson Avenue, Bridge Approach (now Queens Boulevard), Honeywell Street, Harold Avenue (now 39th Street), and Laurel Hill Avenue (now 43rd Street) at the eastern edge of yard—and miles of track were laid. The construction of the Bridge Approach viaduct, opened in December 1910, was a direct result of the construction of the Queensboro Bridge in 1901-08. It was built by the Pennsylvania Railroad to provide an outlet for traffic that came off the first bridge to connect Queens to Manhattan.

The general plan of Sunnyside Yard was submitted to the Board of Estimate and Apportionment in June 1906 and approved in February 1907. The purpose of the yard was to furnish facilities for the storage and care of passenger train equipment using Pennsylvania Station. Sunnyside Yard was divided into two separate yards, the "North Yard" and "South Yard." The North Yard would be used to store suburban railroad cars and the South Yard would be used for storage, cleaning, and repair of Pullman Company cars, dining cars, and coaches. In between the two were planned numerous yard buildings "devoted to the various motive-power requirements," including a power house and auxiliary sub-station, battery repair house, and general store house. Built in 1910, these structures were fire-proof, constructed of brick, with steel frames and flat roofs. Additional buildings erected in Sunnyside Yard—switch houses and a larger Yardmaster's Office—were also built of brick with hipped roofs and bay windows. A total of 22 buildings were originally built in the yard. The Sunnyside Yard buildings, though modest in detailing and appearance, were key to the efficient functioning of the yard and the Pennsylvania Railroad and independent Pullman Company. In subsequent years, some of the structures have been removed and a variety of new structures have been built in Sunnyside Yard. The latter include a laundry building between the auxiliary substation and battery house.

C. EXISTING CONDITIONS

There are no known historic resources located within any of the TSM APEs. Three structures that appeared could be potential historic resources have been previously determined ineligible for listing on the State and National Registers as part of an unrelated project, described below. There are no potentially eligible historic resources within the remaining TSM APEs.

Both officially designated and potential historic resources have been identified within the APEs defined for the Preferred Alternative. There are 10 designated historic structures located within the Manhattan alignment APE, a historic district within the Queens alignment APE, and two historic bridges located just outside the Highbridge Yard APE. There are no known historic resources (i.e., properties listed or eligible for listing on the S/NR, NHLs, NYCLs, or properties that have been considered for NYCL designation) in the remaining project APEs—Roosevelt Island and Blissville, Maspeth, and Fresh Pond Yards. A total of 12 historic structures potentially eligible for listing on the S/NR were identified within the APEs—8 within the Manhattan alignment APE and 4 within the Queens alignment APE. Of these resources, a total of six structures—four in Manhattan and two in Queens—have been determined to meet eligibility criteria by SHPO. Three resources in Manhattan await determinations of eligibility. There are no potentially eligible historic resources located within the Roosevelt Island APE and Maspeth, Fresh Pond, Blissville, and Highbridge Yard APEs.

A brief discussion of historic resources in the applicable APEs follows. APEs in which no designated or potential resources were identified are not discussed.

TSM ALTERNATIVE

Within the APE for the covered pedestrian walkway between the Long Island City station and East River ferry terminal, three structures may fall within the APE depending upon the trajectory of the walkway, which has not yet been designed. Two 2-story brick structures, located along the west side of Second Street contiguous with the ferry parking lot, were constructed in the early 20th century as tunnel ventilation facilities for the Pennsylvania Railroad's New York Tunnel Extension Project, and are similar in character to those erected for that project in Sunnyside Yard. However, as part of the *Hunters Point Waterfront Development Final Environmental Impact Statement* (June 1990), SHPO determined in December 1989 that these structures are not eligible for listing on the State and National Registers of Historic Places. Furthermore, a small one-story, Romanesque Revival-style stone structure on Second Street near Borden Avenue at the ferry terminal, formerly a bank erected in 1890, has also not been determined eligible for listing on the Registers in conjunction with the environmental review for the Hunters Point Waterfront Development Project. Therefore, there are no potentially eligible historic resources located within this APE.

MANHATTAN ALIGNMENT

As described above, the project's APE in Manhattan includes areas close to major construction elements or visual changes associated with the Preferred Alternative. Historic resources in that APE are as follows.

KNOWN HISTORIC RESOURCES

The 10 designated historic resources within the Manhattan alignment APE are among the most well known of New York City's historic resources (see Table 7-1 and Figure 7-7). Most prominent of these is **Grand Central Terminal** (NHL, S/NR, NYCL), which was saved from demolition by being one of the first buildings to be designated as a NYCL by the New York City Landmarks Preservation Commission (LPC). The entire terminal is listed on the S/NR. The exterior and portions of the public spaces in the Main and Suburban Concourse levels are NYCLs (Figure 7-7 #1). Completed in 1913, Grand Central is a monumental but low-rise structure. It is a scientific and artistic accomplishment—a major engineering feat and an architectural treasure. The overall execution of GCT was the work of three talents: engineer William Wilgus and architects Reed & Stem and Warren & Wetmore. Wilgus conceived the terminal's two-tier underground track design. With a loop at its southern end, it allows empty trains to be moved out of the station as quickly as possible. Reed & Stem developed the pedestrian ramp concept for the interior and the elevated roadway that surrounds the building and connects Park Avenue from 40th Street on the south to 46th Street on the north. As described below, this viaduct is separately designated as a historic resource. Whitney Warren was responsible for the building's monumental Beaux-Arts facade and design of the interior. The clock and sculpture on the facade, by Jules-Felix Coutan, boasts a group of figures representing Mercury, Hercules, and Minerva.

Its public interior spaces, including the Main and Dining (formerly Suburban) Concourses and the Biltmore Room are grand, marble-clad rooms with connecting vaulted passageways. The Main Concourse is a voluminous space, 275 feet long, 120 feet wide, and 125 feet high, with a barrel vaulted ceiling decorated with illuminated constellations. Its north wall is lined with the arched open entrances to the Metro-North Railroad (MNR) tracks and platforms, and its south wall occupied by a series of marble ticket booths. The Biltmore Room, on the Main Concourse level, is a large, square space with glossy marble walls and a high ceiling, currently occupied by a modern newsstand in the center of the room. The Dining Concourse is also an inspiring visual space, with the entrances to the Metro-North tracks extending along the north wall surmounted by sculpted foliate arched plaques. The flow of pedestrians between the many entrances, exits, ramps, and passages not only works efficiently to connect the terminal with other systems around it, but acts to create a sense of unity as well. Given the function and life of GCT, many view the terminal complex as the greatest micro-city in America. The ceiling of the main concourse was recently restored as part of a major restoration and renovation of the terminal's interior. This ongoing project also included construction of an originally planned grand staircase on the east side of the concourse to match the one on the west side, and newly designed retail spaces, including on the Main Concourse level along the Biltmore Concourse and the Lexington and Shuttle Passageways, in keeping with the historic character of the interior spaces.

Table 7-1
Known Historic Resources Within the Manhattan Alignment APE*

Ref. No.	Name	Address	NYCL	SR	NR	NHL	Pending NYCL	S/NR Eligible
1	Grand Central Terminal	East 42nd Street at Park Avenue	X	X	X	X		
2	Park Avenue Viaduct	Park Avenue between East 40th and East 42nd Street	X	X	X			
3	Grand Central Terminal Post Office	Southwest corner of Lexington Avenue and East 45th Street						X
4	New York Central (Helmsley) Building	230 Park Avenue	X					
5	Waldorf-Astoria Hotel	301 Park Avenue	X					
6	St. Bartholomew's Church and Community House	Park Avenue at East 50th Street	X	X	X			
7	Seagram Building	375 Park Avenue	X					
8	Four Seasons Restaurant (interior)	99 East 52nd Street	X					
9	Lever House	390 Park Avenue	X	X	X			
10	Racquet and Tennis Club	370 Park Avenue	X	X	X			

Notes:

* See accompanying Figure 7-7.

NYCL:	New York City Landmark.
SR:	New York State Register of Historic Places.
NR:	National Register of Historic Places.
NHL:	National Historic Landmark.
Pending NYCL:	Site has been calendared for a public hearing about its designation as a New York City Landmark or heard for designation as such.
S/NR Eligible:	Site has been found eligible for listing on the New York State and National Registers of Historic Places.

Other routine changes performed in the below-grade portions of GCT through time have likely removed original mechanical features. As identified in the Major Investment Study (MIS) published for the Long Island Transportation Corridor for the MTA/Long Island Rail Road East Side Access project in April 1998, it is unlikely that original below-grade mechanisms associated with the signaling system at the terminal—including signaling stations, switching mechanisms, or other original features related to the electrification and operation of the railroad—remain extant. These mechanisms, while considered technologically innovative at the time of construction, have subsequently been replaced, upgraded, or removed as part of the routine maintenance of the system throughout the years. In addition, correspondence with SHPO during preparation of the MIS indicated that the underground signal systems and mechanical controls of a similar historic resource were eliminated from further eligibility consideration. Likewise, tracks are replaced frequently and platforms are periodically upgraded. During preparation of the MIS, the tracks and platforms at GCT were determined not eligible for the Registers by SHPO.

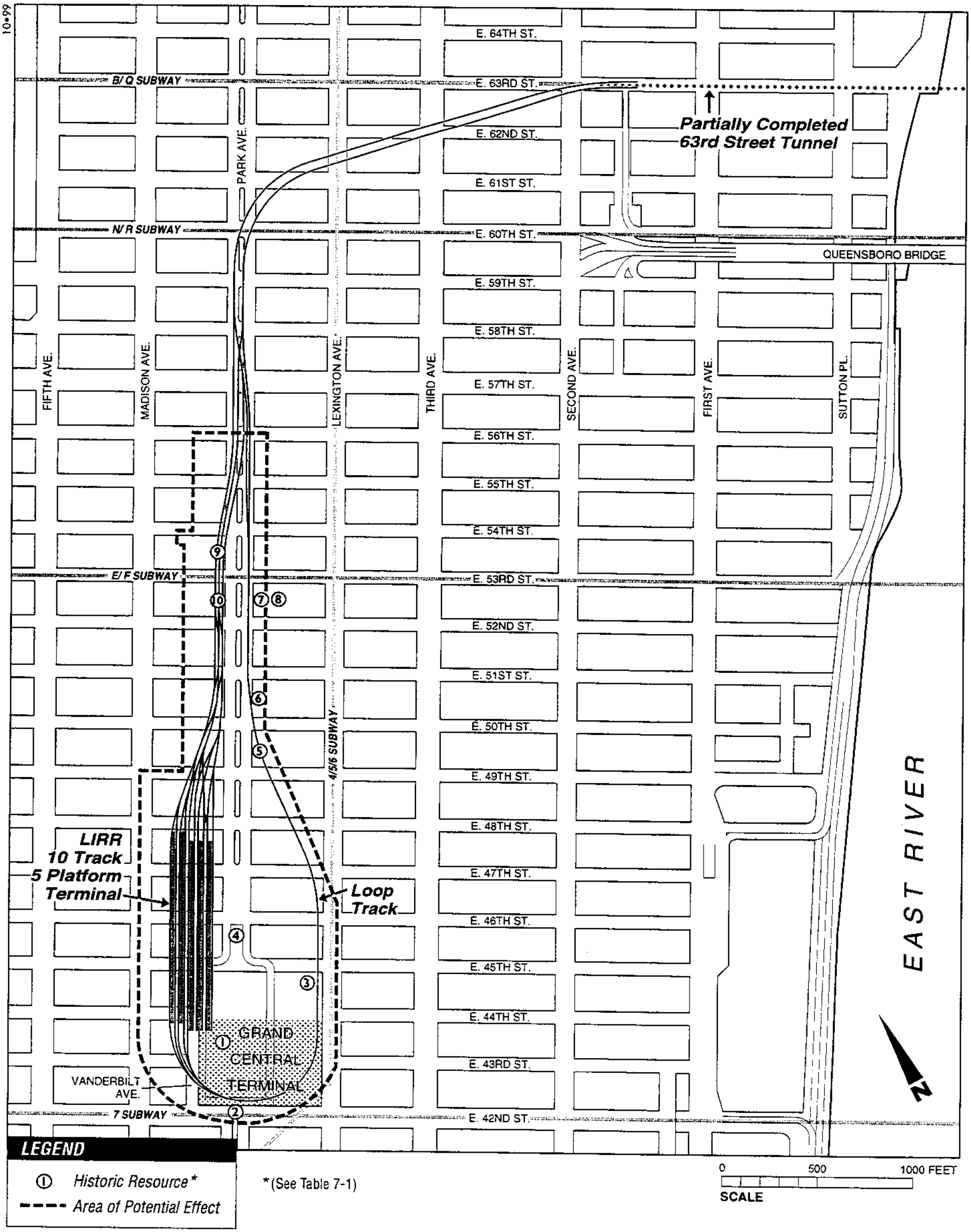
Part of the elevated roadway that carries Park Avenue traffic around GCT, the **Park Avenue Viaduct** (S/NR, NYCL) was completed in 1919. The viaduct is connected to the upper story of the terminal on the south facade, rising from 40th Street in the center of Park Avenue for a distance of two blocks to meet the elevated roadway on the south facade of GCT (Figure 7-7 #2). It was conceived by Reed & Stem as part of the original 1903 plan for the station and its design carried out by Warren & Wetmore.

The **United States Post Office at GCT** (S/NR-eligible) is a monumental 8-story-tall building located northeast of GCT (Figure 7-7 #3). It was built between 1906-1919 to the designs of Warren & Wetmore and Reed & Stem, and is one of only a few surviving elements of Grand Central Terminal City. It is distinguished by a rusticated stone ground story and variety of decorative features. It is significant for its early Beaux-Arts design in the grand style deemed appropriate for the great public services of urban centers and as part of an early attempt at creating a planned sector of the city. Originally meant to be topped by an additional 12 stories, a tower was recently constructed above it.

The **New York Central Building** (NYCL) is located one block north of GCT (Figure 7-7 #4). The 35-story-tall office building straddles Park Avenue between 45th and 46th Streets and is now know as the Helmsley Building. It is related to GCT, and was also designed by Warren & Wetmore and built in 1927-1929 to be the headquarters of the New York Central Railroad and the lynchpin of the complex of hotels and office buildings sponsored by the railroad. The tower, with its pyramidal roof and ornate cupola, once dominated Park Avenue. On each side, the tower is flanked by lower wings. Arches in the base permit north- and southbound traffic to flow around GCT. In the interior, which is also part of the Landmark designation, there is an impressive lobby and two pedestrian corridors (known as the East and West Helmsley Walks) between 45th and 46th Streets. As part of MTA MNR's Grand Central North project, two pedestrian entrances have recently been completed at the East and West Helmsley Walks to create street level and train platform connections. Continuing up Park Avenue to 49th Street, the **Waldorf-Astoria Hotel** (NYCL) occupies an entire city block (Figure 7-7 #5). Designed by the firm of Schultze & Weaver and built between 1929 and 1931, it is perhaps New York's most famous hotel. The building is also is a good example of the Art Deco style, with beacon-topped vertically massed towers rising to 47 stories, grey brick and limestone exterior, and Art Deco detailing.

St. Bartholomew's Church (S/NR, NYCL) and its adjoining courtyard is on Park Avenue in the block north of the Waldorf-Astoria Hotel (Figure 7-7 #6). Constructed in 1914-1919, the Byzantine-inspired design is a good example of the work of Bertram Goodhue of Cram, Goodhue & Ferguson. It features bands of limestone and salmon-colored brick, and carvings representing the life of Saint Bartholomew. The triple-arched entrance portal on Park Avenue, designed by Stanford White of McKim, Mead & White, was moved to this site from the congregation's previous church on Madison Avenue. The adjacent Community House, added in 1926-1928, complements the church's design.

Two blocks north of the Waldorf-Astoria Hotel is the **Seagram Building** (NYCL), built in 1955-58 (Figure 7-7 #7). This is the only building in New York designed by International Style master Mies van der Rohe and an outstanding example of the corporate International Style glass tower. The tower rises behind an open plaza on Park Avenue with a curtain wall composed of bronze spandrel panels and transparent glass. The lobby, designed by Philip Johnson, is also included in the designation, and provides access to the **Four Seasons Restaurant** (NYCL), an interior landmark also designed by Johnson (Figure 7-7 #8). The use of high quality materials such as travertine for the lobby walls and bronze, wood, and marble of the finest craftsmanship in the Four Seasons are further representative of the International Style's restrained and elegant



*(See Table 7-1)

Figure 7-7
Manhattan Alignment – Known Historic Resources

characteristics. Johnson's collaboration with a variety of other expert designers in the fields of furniture, horticulture and industrial design resulted in a series of unified spaces that makes the restaurant one of the most notable International Style interiors in the United States.

Another icon of the corporate International Style is **Lever House** (S/NR, NYCL) occupying the Park Avenue blockfront between 53rd and 54th Streets (Figure 7-7 #9). Designed by Gordon Bunshaft of Skidmore, Owings & Merrill and built in 1950-52, this building heralded the advent of the glass curtain-wall skyscraper as the new symbol of corporate America and precipitated the transformation of Park Avenue south of 59th Street from an area of masonry residential buildings to tall glass office buildings. The building is undergoing a major restoration of its curtain wall structural system.

Directly south of Lever House and offering a contrast to that building's design is the **Racquet & Tennis Club** (S/NR, NYCL), an outstanding survivor from Park Avenue's history as a luxury avenue lined by fine masonry institutional and apartment buildings (Figure 7-7 #10). Built in 1916-1919, the 5-story building designed in the form of a Renaissance palazzo is representative of the style established by the architectural firm of McKim, Mead & White for private club design.

POTENTIAL HISTORIC RESOURCES DETERMINED ELIGIBLE FOR LISTING ON THE S/NR

Four potential historic resources identified within the Manhattan alignment APE have been determined to meet eligibility criteria for listing on the S/NR (see Table 7-2 and Figure 7-8). These resources are extant structures remaining from the Terminal City development above the tracks around GCT. They form a cohesive group defined by a similarity in height, construction materials—stone, terra-cotta, and buff brick—and design, with prominent stone base, cornice, and classical detailing. However, intervening modern buildings preclude creation of a contiguous historic district. Therefore, the properties were identified as potentially individual eligible resources.

The **Vanderbilt Avenue Building** spans the blockfront between East 42nd and East 43rd Streets across Vanderbilt Avenue from GCT (see Figures 7-8 #1 and 7-9). The 6-story limestone base of the building was erected in 1913 and designed by Warren & Wetmore. It is distinguished by elegant classical detailing, including window treatment defined by slender Corinthian columns, ornamental plaques, and a dentiled cornice. It was erected as an office building by the American Real Estate Company, to which the property was leased by the New York Central Railroad. An ad placed in the January 4, 1913 *Real Estate Record & Guide* advertised the building's provision of "direct, indoor passageways to Grand Central and subways" and its location "in the heart of the most talked about business section in the City." By 1929, 11 additional stories had been erected above it, consisting of nine stories faced in brick topped by a 2-story attic and bracketed cornice.

Two blocks north is the **Yale Club**, located at the northwest corner of Vanderbilt Avenue and East 44th Street (see Figures 7-8 #2 and 7-9). It was built by the Yale Leasing Company on property owned by the New York Central Railroad. Designed by James Gamble Rogers in 1915, it is 21 stories tall with a facade principally neo-classical in derivation. It has a limestone base with arched windows at the second story and flat pilasters spanning the third to fifth stories. It is crowned by a loggia with a prominent bracketed cornice at the 21st floor. The Yale Club was started in 1897 at a house at Madison Square, subsequently moving to a location at 30 West 44th

Street due to an increase in membership. The growth of the institution as a national center of Yale graduate influence affected its decision for a new location, in proximity to GCT and its commuter trains to New Haven, Connecticut. The structure was in fact built over the railroad tracks with an underground pedestrian connection to GCT. Its construction on property owned by the New York Central Company necessitated compliance with design regulations imposed by the railroad, including materials and height—a well-defined cornice at a level of about 81 feet above the street. James Gamble Rogers, a noted early 20th century architect, designed several prominent buildings in New York, including Butler Library at Columbia University and the Columbia-Presbyterian Medical Center. He also served as Architectural Advisor for Yale University, designing the Harkness Memorial Quadrangle and most of the Yale colleges at the University.

The **Vanderbilt Concourse Building** is immediately adjacent to the Yale Club on Vanderbilt Avenue, occupying the southwest corner at 45th Street (see Figures 7-8 #3 and 7-10). It is an office building designed by Warren & Wetmore and constructed in 1914 by the New York Central Co. It is 20 stories high, with a buff-colored brick facade above a 6-story limestone base. The base is enlivened by decorative details such as plaques beneath the windows on the third through fifth stories and between the windows on the sixth story. It is crowned on each facade by a 3-story central loggia and cornice, beneath which there is a balcony supported on corbels.

Directly east of GCT, the **Graybar Building** was erected in 1925 to the designs of Sloan & Robertson (see Figures 7-8 #6 and 7-11). At the time of construction, it was the largest office building in the world. It is 30 stories high and faced in a buff-colored brick above a limestone base relieved by a mixture of abstract Classical and Moorish elements. Pavilions rise on either side of a 2-story base, creating a large exterior court along Lexington Avenue. The building's basements were built as an extension of GCT, and a portion of the ground floor was utilized as space for the adjacent Grand Central Post Office. The southernmost of the building's three entrances provides direct access to GCT via a concourse running the depth of the building. Currently, the Graybar building is undergoing a major capital improvement program, to include a new lobby, and exterior work is underway at the base of the building to create a new entry and storefronts.

POTENTIAL HISTORIC RESOURCES

Three potential historic resources are awaiting eligibility determinations. These resources are also extant structures remaining from the Terminal City development. They are of a similar visual and historic character as the above buildings determined eligible for S/NR listing, in terms of design, height, and materials (see Table 7-2 and Figure 7-8).

The **Roosevelt Hotel**, a 22-story building, occupies the entire block bounded by Madison and Vanderbilt Avenues between 45th and 46th Streets (see Figures 7-8 #4 and 7-10). Built in 1924, it was designed by George B. Post, a prominent New York architect of that era. It is set on a 4-story limestone base ornamented with Italian Renaissance details such as columned loggias and balustrade balconies. The building has a prominent 3-story attic defined by a dentiled string course, quoins, and stone window surrounds, surmounted by a cornice. Dedicated to the memory of Theodore Roosevelt, its interiors were designed in such American evocative styles as Colonial and Adams. The Roosevelt was the first hotel to incorporate ground-floor shops in an attempt to find a substitute source of revenue for the sale of liquor, banned during the Prohibition years (1920-1933).

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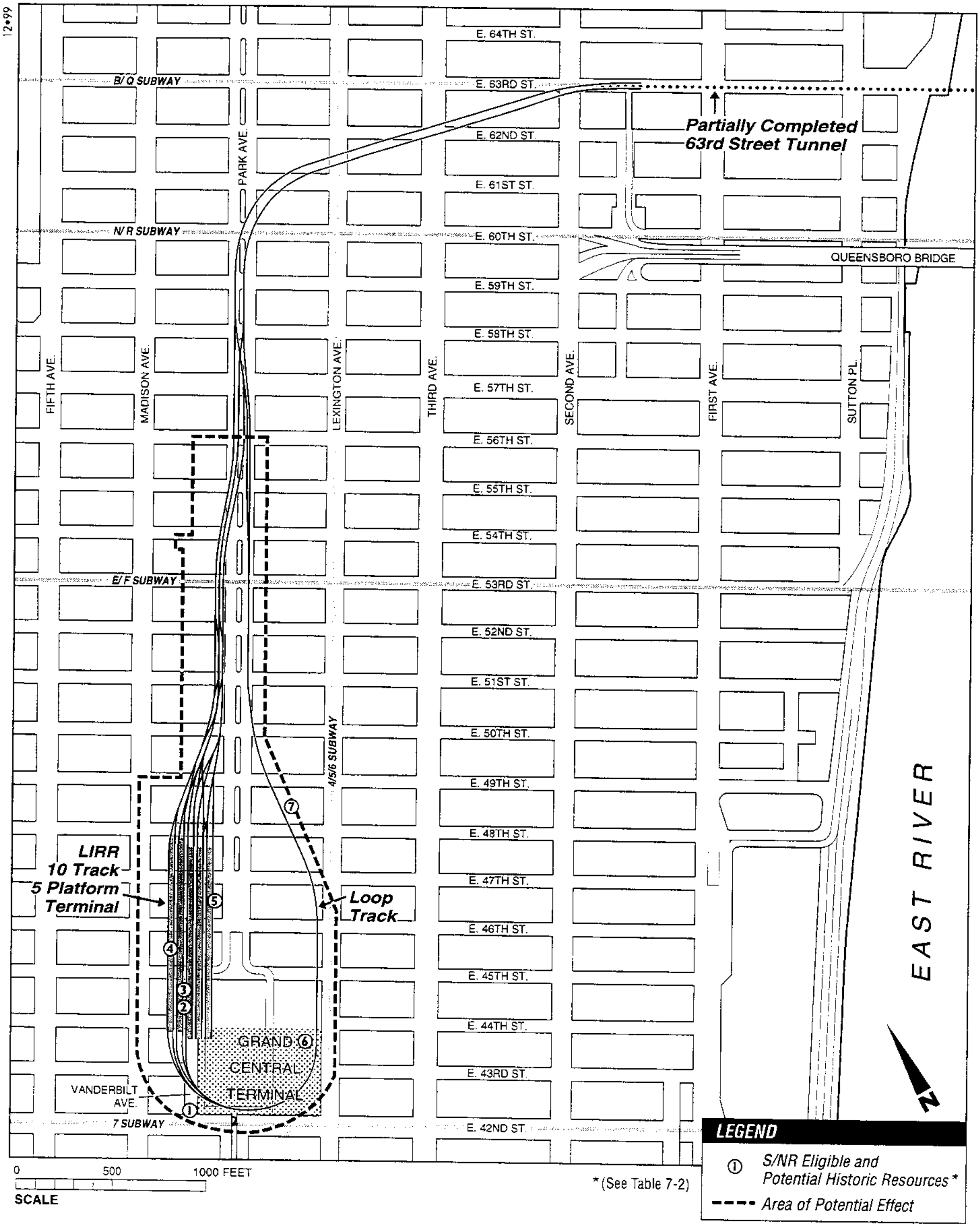
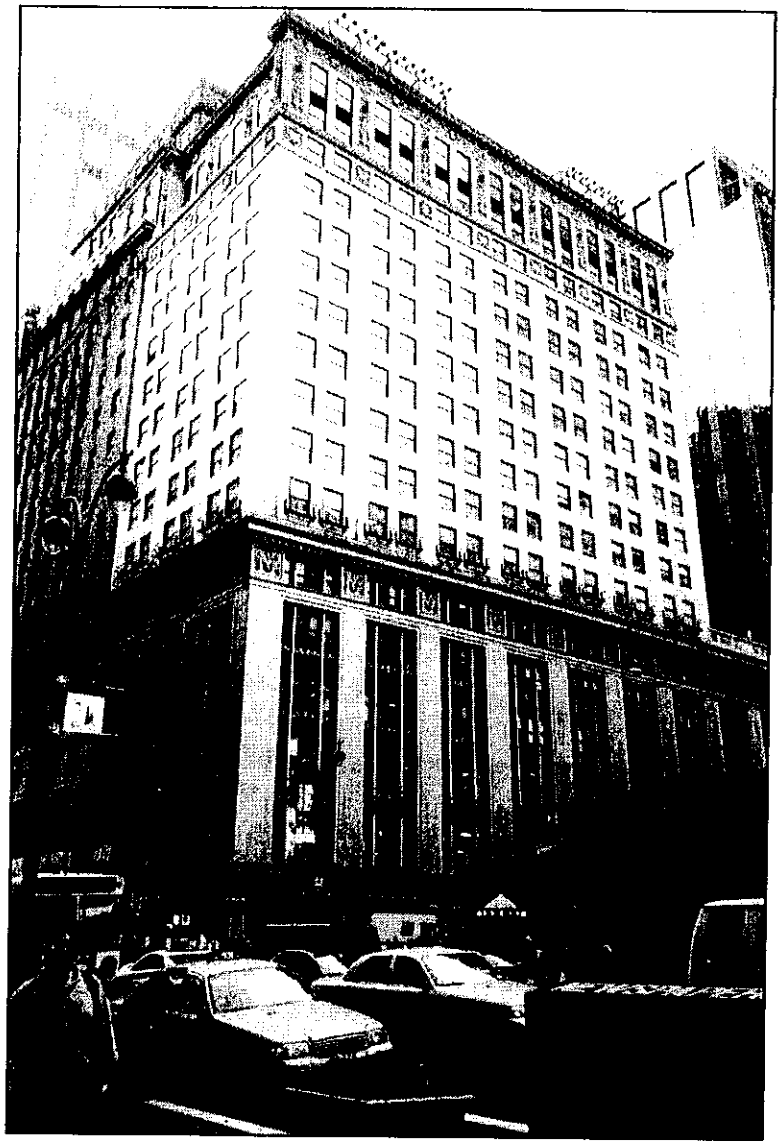


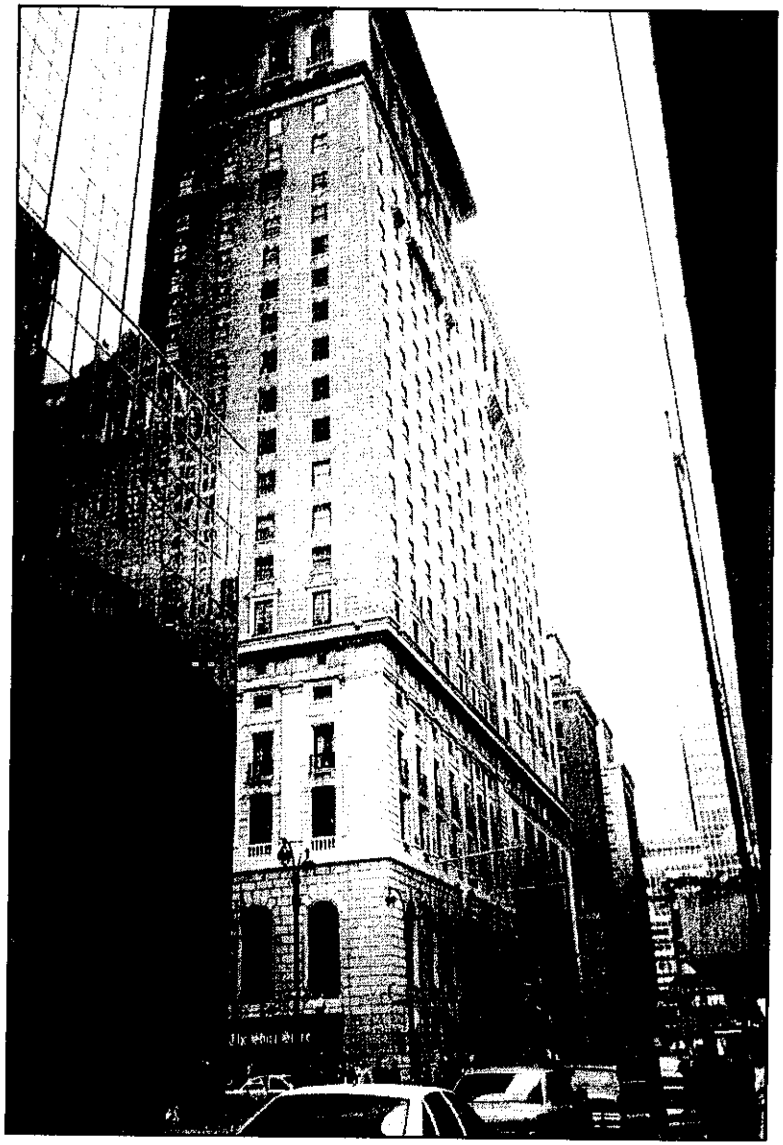
*(See Table 7-2)

Figure 7-8

Manhattan Alignment – State/National Register Eligible and Potential Historic Resources



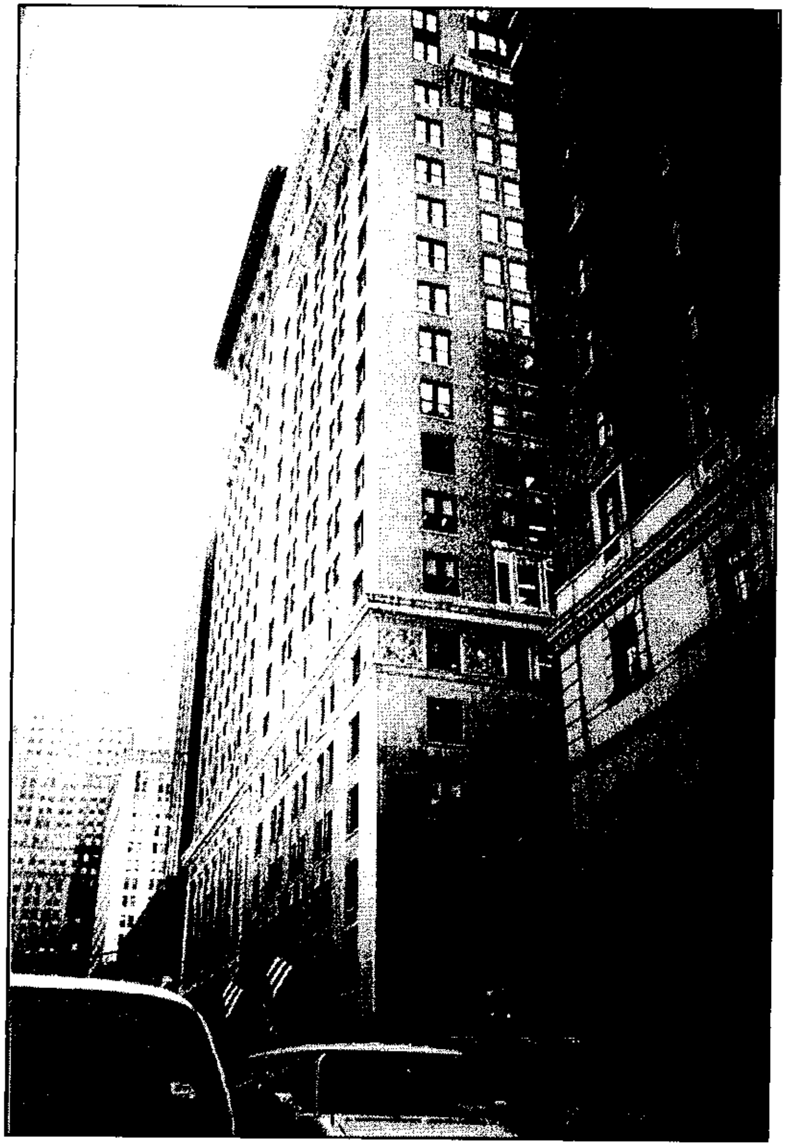
Vanderbilt Avenue Building, 51 East 42nd Street **1**



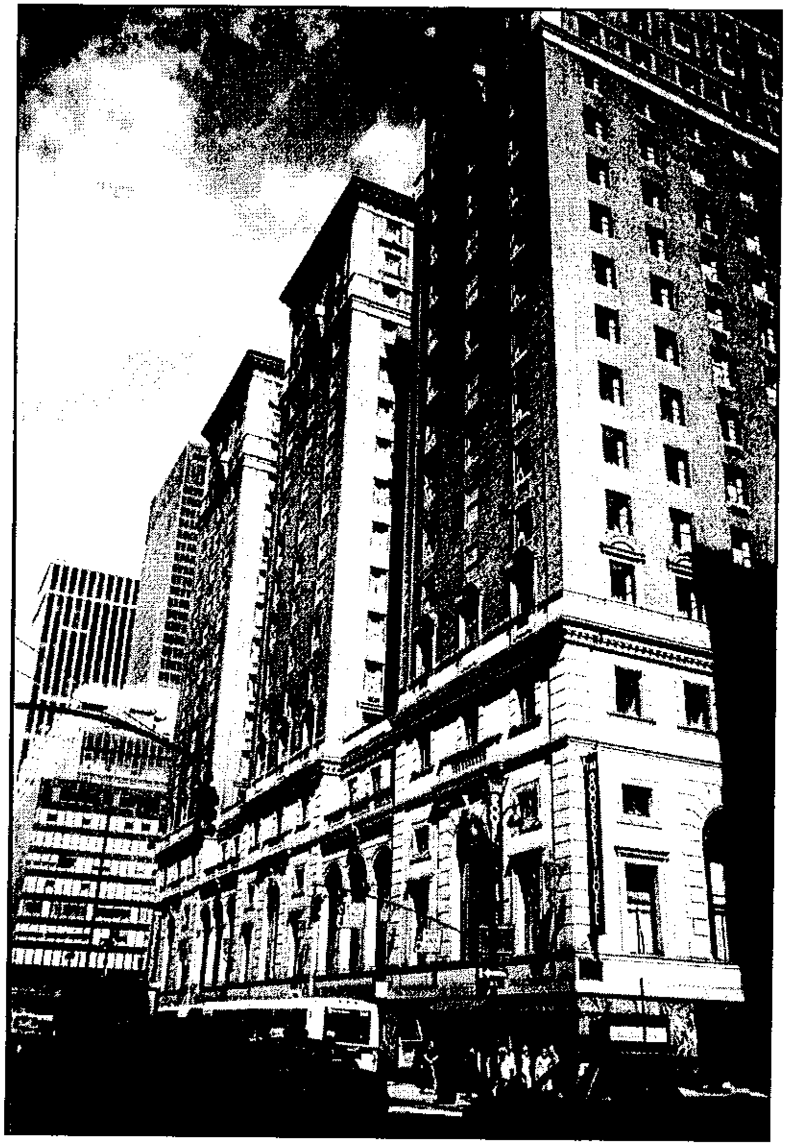
Yale Club, 50 Vanderbilt Avenue **2**

Figure 7-9

**Manhattan Alignment APE •
State/National Register Eligible Historic Resources**



Vanderbilt Concourse Building, 52 Vanderbilt Avenue **3**



Roosevelt Hotel, 45 East 45th Street **4**

Figure 7-10

Manhattan Alignment APE •
State/National Register Eligible and Potential Historic Resources

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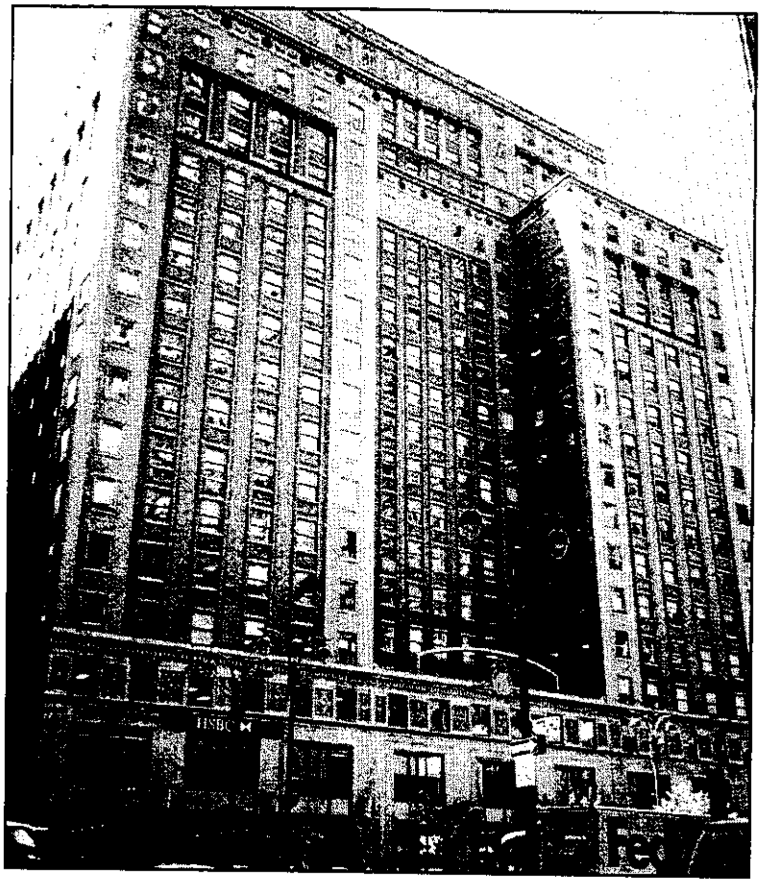
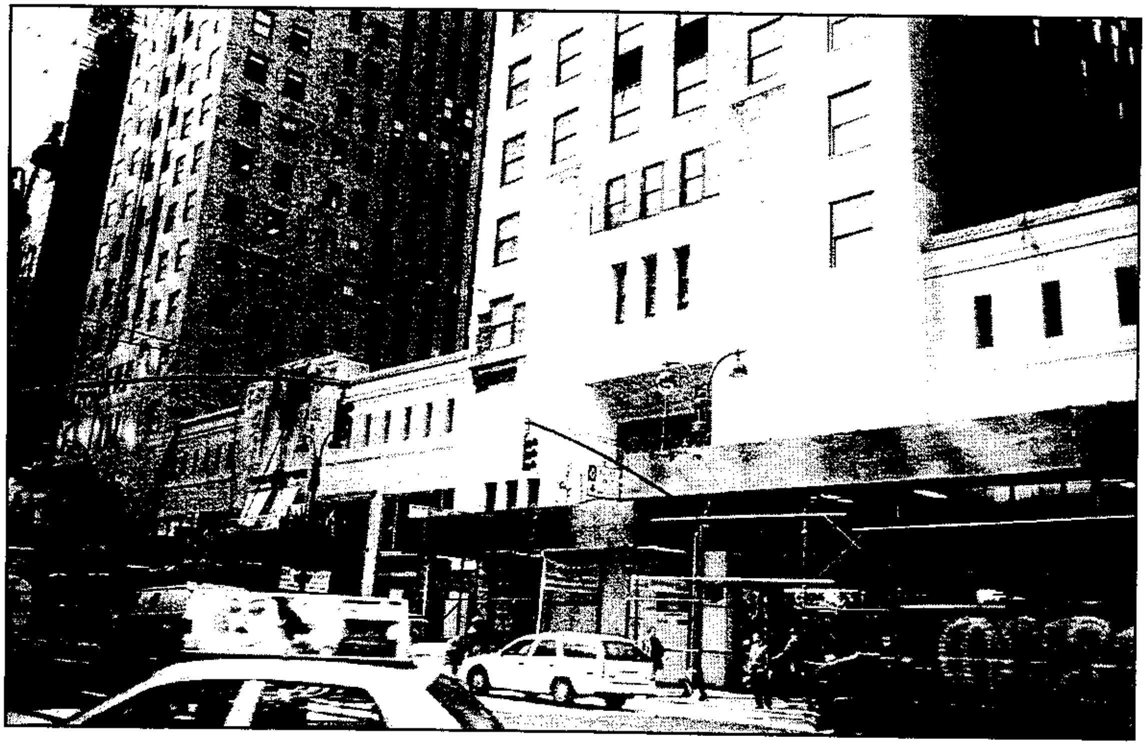


Postum Building, 250 Park Avenue **5**



Graybar Building, 420 Lexington Avenue **6**

MTA / LIRR

East Side Access

Figure 7-11

Manhattan Alignment APE •
State/National Register Eligible and Potential Historic Resources

Table 7-2
Determination of Eligibility for Potential Historic Resources Identified Within the Manhattan Alignment APE*

Ref. No.	Name	Address	Block	Lot	Notes	Determined		Pending Eligibility Determination
						Eligible**	Not Eligible	
1	Vanderbilt Avenue Building	51 East 42nd Street	1277	27	1913; Warren & Wetmore	X		
2	Yale Club	50 Vanderbilt Avenue	1279	28	1915; James Gamble Rogers	X		
3	Vanderbilt Concourse Building	52 Vanderbilt Avenue	1279	45	1914; Warren & Wetmore	X		
4	Roosevelt Hotel	45 East 45th Street	1281	21	1924; George B. Post			X
5	Postum Building	250 Park Avenue	1282	34	1925; Cross & Cross			X
6	Graybar Building	420 Lexington Avenue	1280	60	1925-27; Sloan & Robertson	X		
7	Hotel Intercontinental (formerly Barclay Hotel)	111 East 48th Street	1303	14	1927; Cross & Cross			X
8 **	Chase Manhattan Bank (formerly Union Carbide Building)	270 Park Avenue	1283	21	1957; Skidmore, Owings & Merrill		X	

Notes:
* Corresponds to Figure 7-8. Determined eligible: eligibility determination made by SHPO, November 1999.
** Only resources determined eligible for listing on the S/NR and potential resources pending eligibility determinations are mapped.

The **Postum Building** occupies the block bounded by Park and Vanderbilt Avenues between East 46th and East 47th Streets (see Figures 7-8 #5 and 7-11). Set on a large limestone base, the building is U-shaped with wings that rise 16 stories flanking a central block of 20 stories. It was designed by Cross & Cross in an understated Classical vocabulary and built in 1924. It has brick facades and terra-cotta ornament, with decorative features including plaques along the top of the base and colonnades between the 18th and 19th floors. Cross & Cross worked primarily in New York City and are known for their designs of corporate offices, including the Art Deco RCA Tower (now the General Electric Building) and the Citibank-Farmers' Trust Building, and upper-class apartment buildings.

North on Lexington Avenue, the former **Barclay Hotel** (now the Hotel Intercontinental) occupies the eastern portion of the block along Lexington Avenue between East 48th and East 49th Streets (see Figures 7-8 #7 and 7-12). At the time of construction in 1927, the building filled a fully independent block bounded on the west by Park Lane, a former street that bisected the block. Designed by Cross & Cross, the Barclay was built as a luxurious apartment hotel that catered to relatively permanent tenants. It is 14 stories high, "H" shaped in plan, and Renaissance Revival in style. The primary entrance on East 48th Street consists of three round-arched entrances. It is faced in brick above a 3-story limestone base. Balconies on scrolled brackets, limestone string courses, and a decorative 14th-story attic surmounted by a cornice reflect its history as a luxury residential building.

QUEENS ALIGNMENT

KNOWN HISTORIC RESOURCES

The Sunnyside Gardens Historic District (S/NR) consists of a planned residential community built between 1924 and 1935, covering an area of roughly 16 city blocks (see Figure 7-13). Sunnyside Gardens was conceived and designed by the founders of the Regional Planning Association of America (RPAA), including architect Clarence Stein; landscape architect Henry Wright; Alexander Bing, a wealthy philanthropist; and historian Lewis Mumford. Consisting of primarily low-scale brick rowhouses surrounding landscaped interior courtyards, some apartment houses, parks, and playgrounds, Sunnyside Gardens was the first planned community in the United States that reflected the utopian ideal of the British garden city movement. Embraced by the RPAA founders, the movement favored the development of small self-sufficient communities with plenty of open space and replacement of the large, unhealthy, and congested urban environment. The Sunnyside Gardens Historic District is across Barnett Avenue from the LIRR's Main Line tracks just east of Sunnyside Yard. The tracks here are on an embankment separated from Barnett Avenue by low-rise garages and industrial buildings.

POTENTIAL HISTORIC RESOURCES DETERMINED ELIGIBLE FOR LISTING ON THE S/NR

Two potential historic structures identified within Sunnyside Yard in the Queens alignment APE have been determined to meet eligibility criteria for listing on the S/NR (see Table 7-3 and Figure 7-14). These structures date from the original construction of Sunnyside Yard and are Switch Tower Q, and Office. The two buildings were erected by the Pennsylvania Railroad in 1910 under contract by the John F. Ferguson Company, based in Paterson, New Jersey. They are simply designed with ornament typically confined to use of stone lintels and sills, with peaked roofs and bay windows. The outside and party walls were constructed of hard-burned red brick and the structures were built with concrete floors and steel roofs covered with book-tile, roofing-felt, and gravel. They were equipped with steam heating, hot and cold water, toilet facilities, electric lights and telephones. Unlike Pennsylvania Station itself, the buildings in Sunnyside Yard are not particularly distinguished architecturally. They were, however, an integral part of the functioning of Sunnyside Yard, which was a key component in the construction of Pennsylvania Station and the new tunnels that connected the station to areas in New Jersey and Long Island. While the structures serve as examples of railroad architecture of that time, they are potentially significant, not for their architecture, but for their association with the history of the construction of a major railroad project—an historic event that greatly affected transportation patterns in and outside of New York City.

Switch Tower Q is located at the south end of Sunnyside Yard just east of the Queens Boulevard viaduct (see Figures 7-14 #1 and 7-15). Eighty-three feet by 14 feet, it consists of a 2-story block flanked by 1-story wings. It has hipped roofs with copper flashing and a copper bay window on the north facade. This structure was built for combined use as a signal cabin and yardmaster's office and is identified as "Signal Cabin 'Q,' Yardmasters Office" in historic documents pertaining to the construction of Sunnyside Yard.* The 2-story portion of the

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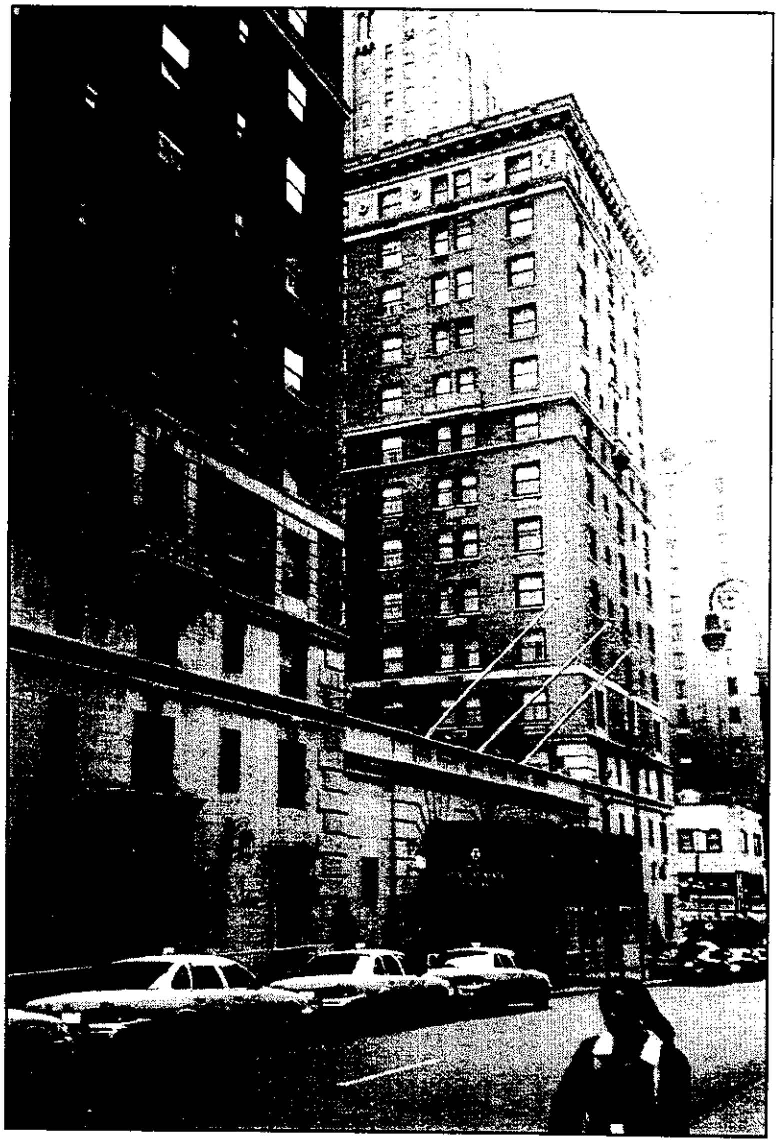
* "The New York Tunnel Extension of the Pennsylvania Railroad," *Transactions of the American Society of Civil Engineers* (1910).



Hotel Intercontinental (formerly Barclay Hotel), 111 East 48th Street **7**

Manhattan Alignment APE • Potential Historic Resources

Table 7-3
Determination of Eligibility for Potential Historic Resources Identified Within the Queens Alignment APE*

Ref. No.	Name	Address	Block	Lot	Notes	Determined	
						Eligible	Not Eligible
1	Switch Tower Q (formerly Signal Cabin Q, Yardmaster's Office)	East of Queens Boulevard Viaduct	239	1	1910	×	
2	Office (formerly Signal Cabin F)	West of Thomson Avenue	72	1	1910	×	
**	Stores & Lavatory Building	Building #3: West of Honeywell Street	239	1	1910; John F. Ferguson Co. for the Pennsylvania Railroad		×
**	Electric Battery/Machine Repair Building	Building #4: West of Honeywell Street	239	1	1910		×

Notes:
* Corresponds to Figure 7-14. Determined eligible: eligibility determination made by SHPO, November 1999.
** Only resources determined eligible for listing on the S/NR are mapped.

building is similar to the signal cabins built in the yard (described below) though described as "special" due to its extension containing tool rooms and the yardmaster's offices.

The small 2-story structure just west of the Thomson Avenue Viaduct, identified on the 1998 Sanborn real estate atlas as "Office" was originally built as **Signal Cabin F**, one of three original signal cabins built in Sunnyside Yard (see Figures 7-14 #2 and 7-15). It is 2 stories, measures 27 feet by 17 feet, with a hipped roof and bay window on the south facade. In historic documents, the signal cabins are described to be of "standard Pennsylvania Railroad type," with the exception of Signal Cabin Q, Yardmaster's Office, described above. Of the remaining two signal cabins, "Switch Tower R" (as identified on the 1998 Sanborn map) is located west of the 39th Street viaduct and is not within the APE. Therefore, it has not been identified as a potential historic resource within in the APE. The other signal cabin—identified on the Sanborn map as a small 2-story structure, "Switch Tower," within the APE between the 39th Street and Honeywell Street Viaducts—was originally built as Signal Cabin H. However, this structure, subsequently named "Harold," was recently demolished and replaced with a more modern structure.

HIGHBRIDGE YARD, THE BRONX

KNOWN HISTORIC RESOURCES

There are no known historic resources within the Highbridge APE. However, there are two historic resources located outside the APE—the High Bridge Aqueduct (S/NR, NYCL) and Macomb's Dam Bridge (S/NR-eligible, NYCL). The former is a National Historic Landmark. These visually prominent historic bridges are briefly described below but are not expected to be affected by the project, as they are outside the APE. Therefore, due to the distance of these resources from the Highbridge APE, there is no potential for direct physical impacts or contextual impacts (see Figure 7-16).

High Bridge spans the Harlem River approximately 800 feet north of the Highbridge APE (Figure 7-16 #1). Built in 1838-48, High Bridge was an integral part of the Croton Aqueduct system which carried drinking water from the Croton Reservoir in Westchester County to New York City. Its design—consisting of 15 stone arches that span the river—was modeled after ancient Roman Aqueducts. In 1923, Navy engineers replaced the central piers in the Harlem River with a steel arch to allow large ships to travel the river. The aqueduct is no longer in use.

Macomb's Dam Bridge, south of High Bridge, extends over the river between West 155th Street and St. Nicholas Place in Manhattan, and Jerome Avenue and East 162nd Street, in the Bronx (Figure 7-16 #2). Designed by Alfred Pancoast Boller and built between 1890-95, it consists of a swing bridge composed of latticework steel topped by finials with piers capped by shelter houses, and steel viaduct approaches on both ends. It is the oldest metal truss swing bridge and third-oldest bridge in New York City.

D. FUTURE CONDITIONS COMMON TO ALL ALTERNATIVES

In the future, the status of the potential historic resources may change. Eligible historic resources may be listed on the State and National Registers, and potential historic resources may be found eligible or listed on the S/NR. Potential historic resources may also be calendared for public hearings and/or designated as NYCLs. It is also possible, given the project's completion year of 2010, that additional sites will be identified as historic resources and/or potential historic resources in this time frame.

Historic resources that are listed on the S/NR or that have been found eligible for listing are given a measure of protection from the effects of federally sponsored or assisted projects under Section 106 of the National Historic Preservation Act. Although preservation is not mandated, federal agencies must attempt to avoid adverse impacts on such resources through a notice, review, and consultation process. Properties listed on the Registers are similarly protected against impacts resulting from state-sponsored or state-assisted projects under the State Historic Preservation Act. Private owners of properties eligible for, or even listed on, the Registers using private funds, can, however, alter or demolish their properties without such a review process. Privately owned properties that are New York City Landmarks, in New York City Historic Districts, or pending designation as Landmarks are protected under the New York City Landmarks Law, which requires LPC review and approval before any alteration or demolition can occur. For example, LPC has recently approved a renovation plan for the East and West Helmsley walks of the designated New York Central Building. Designs call for doubling the height of the passageways by removing the mezzanine floor, installing skylights, restoring the bronze storefronts along the walks, and constructing windows at the 45th Street side of the building to permit pedestrians to see the vehicles traveling on the viaducts. Publicly owned resources are also subject to review by LPC prior to the start of a project; however, LPC's role in projects sponsored by other city or state agencies generally is advisory only.

Changes to the historic resources identified above or to their settings may occur irrespective of the proposed project. It is possible, for example, that without official recognition, potential historic resources may be significantly altered or demolished. As described above, the Graybar building, a potential historic resource, is currently undergoing renovation including exterior work that may affect the appearance of the building. It is possible that some historic resources in the APEs may deteriorate, while others may be restored.

E. PROBABLE IMPACTS OF THE PROJECT ALTERNATIVES

As described earlier, this analysis considers the potential impacts that might occur to identified known and potential historic resources as a result of construction and/or operation of the project alternatives. Because any impact that might occur during construction could result in permanent,

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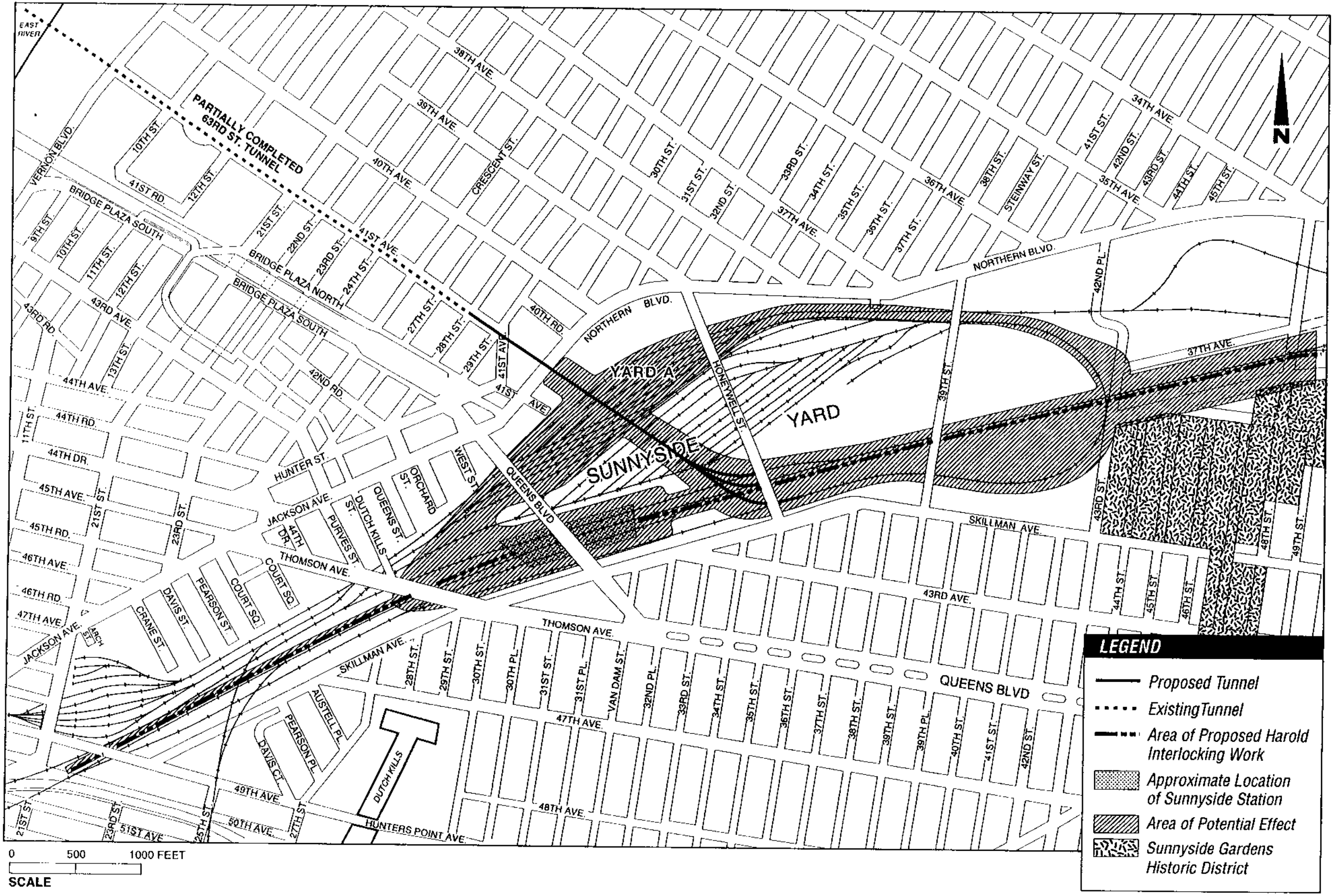

Figure 7-13
Queens Alignment – Known Historic Resources

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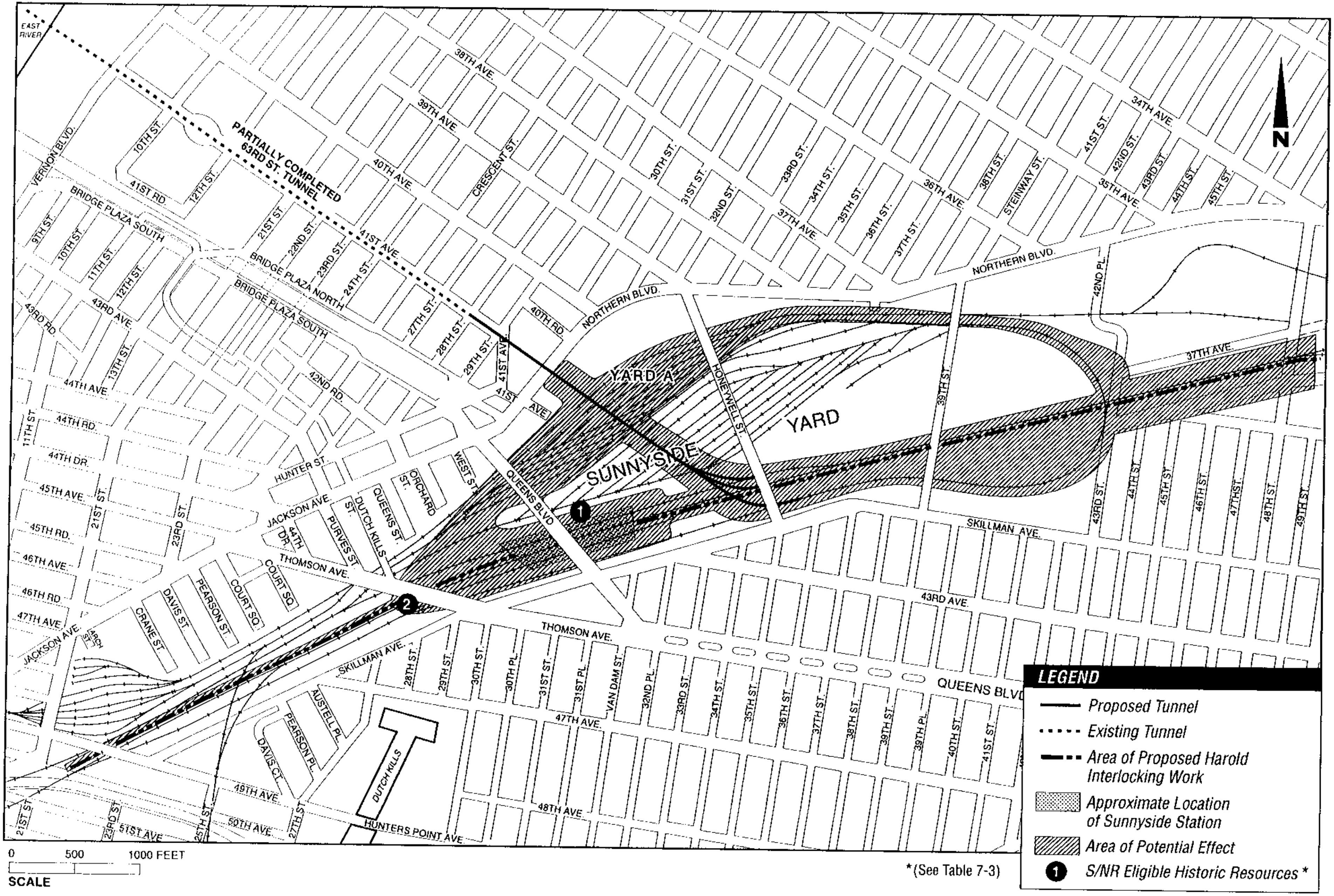
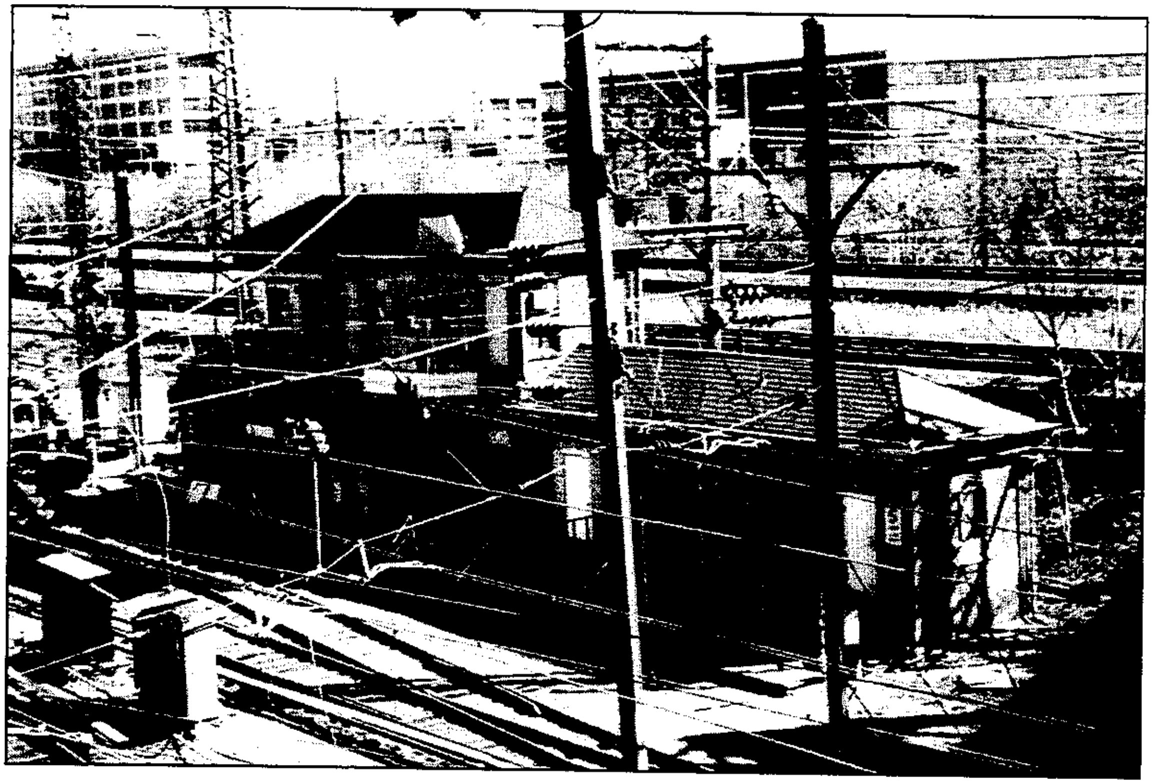


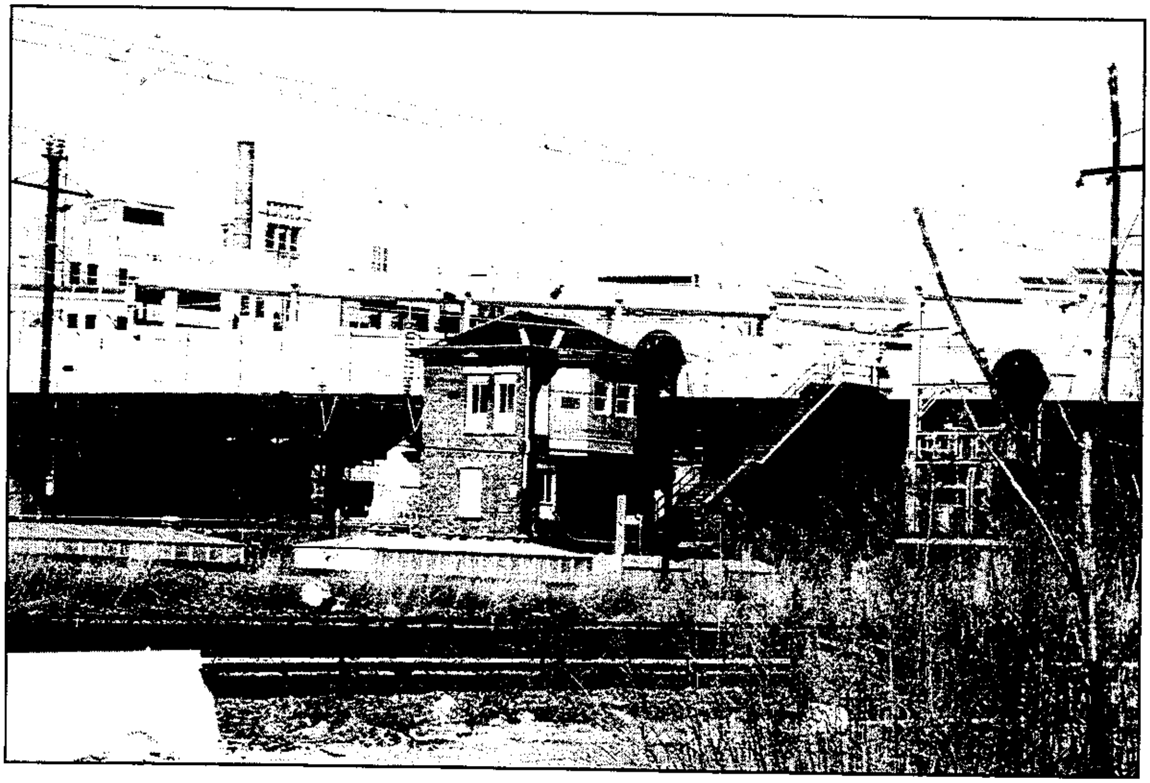
MTA / LIRR
East Side Access

Figure 7-14

Queens Alignment – State/National Register Eligible Historic Resources



Switch Tower Q (formerly Signal Cabin Q Yardmaster's office), Sunnyside Yard **1**



Office (formerly Signal Cabin F), Sunnyside Yard **2**

Figure 7-15

Queens Alignment APE •
State/National Register Eligible Historic Resources

rather than temporary, impacts to historic structures, those impacts are considered in detail below in addition to operational impacts.

NO ACTION ALTERNATIVE

Under the No Action Alternative, none of the potential project impacts described below would occur.

TSM ALTERNATIVE

As described above, the TSM Alternative would require construction of project elements separate from the Preferred Alternative. However, as no known or potential historic resources have been identified in any of the TSM APEs, no impact analysis was undertaken.

PREFERRED ALTERNATIVE

For the Manhattan Alignment, where project elements for Options 1 and 2 differ and may have dissimilar effects, the options are assessed separately. It should be noted that neither option would involve work on, or changes to, the facades of GCT, nor the elevated roadway that surrounds the building. Therefore, no impacts have been assessed for the exterior historic features of the terminal and the Park Avenue Viaduct, which would remain unchanged. Project elements are the same for both options for the Queens alignment and Highbridge Yard in the Bronx; therefore, only one assessment has been conducted for these areas. As no known or potential historic resources have been identified in the Roosevelt Island APE and Blissville, Maspeth, and Fresh Pond Yards APEs, no impact analysis was undertaken.

MANHATTAN ALIGNMENT: GRAND CENTRAL TERMINAL

Potential Physical Impacts

As described in Chapters 2, "Project Alternatives," and 17, "Construction and Construction Impacts," Option 1 would involve both above-ground and below-grade construction within the public areas of the terminal building. Project elements requiring physical changes in the Main and Dining (lower) Concourse levels include:

- On the Main Concourse level—Construction of escalators and elevators in the northern portion of the Biltmore Room and an escalator just outside the room in the Biltmore Concourse. This would require cutting into the floor of the Biltmore Room and Biltmore Passage to make the access connections between the Main Concourse level and a proposed LIRR passenger area to be built below it (described below).
- On the Main Concourse level—Creation of a new LIRR ticketing area to be located either in the Main Concourse or in the area of modern stores along the Shuttle Passageway. If located in the Main Concourse, LIRR ticketing operations and sales would utilize the east, partially used ticketing windows along the south wall. No physical construction would be required, except likely for the installation of signage. If located in the area of the stores along the Shuttle Passageway, construction would involve removal of the retail spaces and replacement with a newly designed space to meet LIRR ticketing functions, requiring, e.g., the construction of ticket sale booths.
- On the Dining Concourse level—Construction along the north wall, in the areas of tracks 114 and 117, to provide access to a newly constructed LIRR passenger area, which would be built adjacent to this area.

In addition, Option 1 would require below-grade work that would be located outside the terminal building in the area of the terminal's subsurface transportation network. Neither construction of the proposed LIRR terminal, nor reconstruction of the lower-level loop track, would have the potential to undermine the structure. The new 10-track, five-platform LIRR terminal to be built in the terminal's lower level would be located in the area of an existing rail yard—Metro-North's Madison Yard, sited away from and northwest of the building. Its construction and that of the LIRR passenger area would also require the removal and reconstruction of several tracks and platforms. The LIRR passenger area would be located adjacent, and connected to, the Dining Concourse level in the area of tracks 114 and 117, and would provide access to the new LIRR terminal. Reconstruction of the lower level of the loop track (which would be lowered) would take place within the existing trackbed of the loop track and would therefore not be expected to affect the structure of the building. Neither the proposed construction of the LIRR terminal and corresponding passenger area nor loop-track work would significantly alter the terminal's historic two-tier track design.

As described in Chapter 2, the deeper station in Option 2 would be constructed beneath the existing lower level of GCT's transportation network, northwest of the terminal building and similarly would not have the potential to undermine the structure. It would connect via escalators to a mezzanine to be built in the existing lower level of the terminal in the area currently occupied by Metro-North's Madison Yard. The new passenger mezzanine area would be occupied by staircases, escalators, and retail uses. This would require that the lower-level loop track be taken out of operation for train use. However, the original design concept behind the loop track, which permitted trains to circle around under the station without having to back out, would still be maintained by the retention of the upper-level loop track, which would remain unchanged structurally and programmatically. Therefore, this change would not constitute a significant adverse impact on the historic character of the terminal building or its transportation uses.

Furthermore, the removal of the tracks and platforms, and other work that may affect subsurface operational mechanisms in Grand Central Terminal for both Options 1 and 2 are not anticipated to have any adverse impacts; either there are no significant historic features remaining, or they have been determined by SHPO not to be eligible for the Registers.

For all of these project elements—those with the terminal building itself and those located in the terminal's transportation portion—design specifications would be sufficiently stringent to ensure that no adverse effects would occur to the building. A construction protection plan would also be implemented to minimize the effects of construction on the historic features of the building, so that construction does not result in any structural or architectural impacts to these features. The plan would be developed in consultation with SHPO and approved by SHPO prior to start of construction.

Potential Contextual Impacts

Visible elements that could change the visual appearance of the public areas of GCT include:

- On the Main Concourse level—The proposed escalators and elevators in and outside the Biltmore Room; proposed LIRR ticketing operations either utilizing the east ticket windows in the Main Concourse or in the area of existing stores off the Shuttle Passageway (Option 1).
- On the Dining Concourse level—Along the northern wall in the area of the entrances to tracks 114 and 117 (Options 1 and 2).

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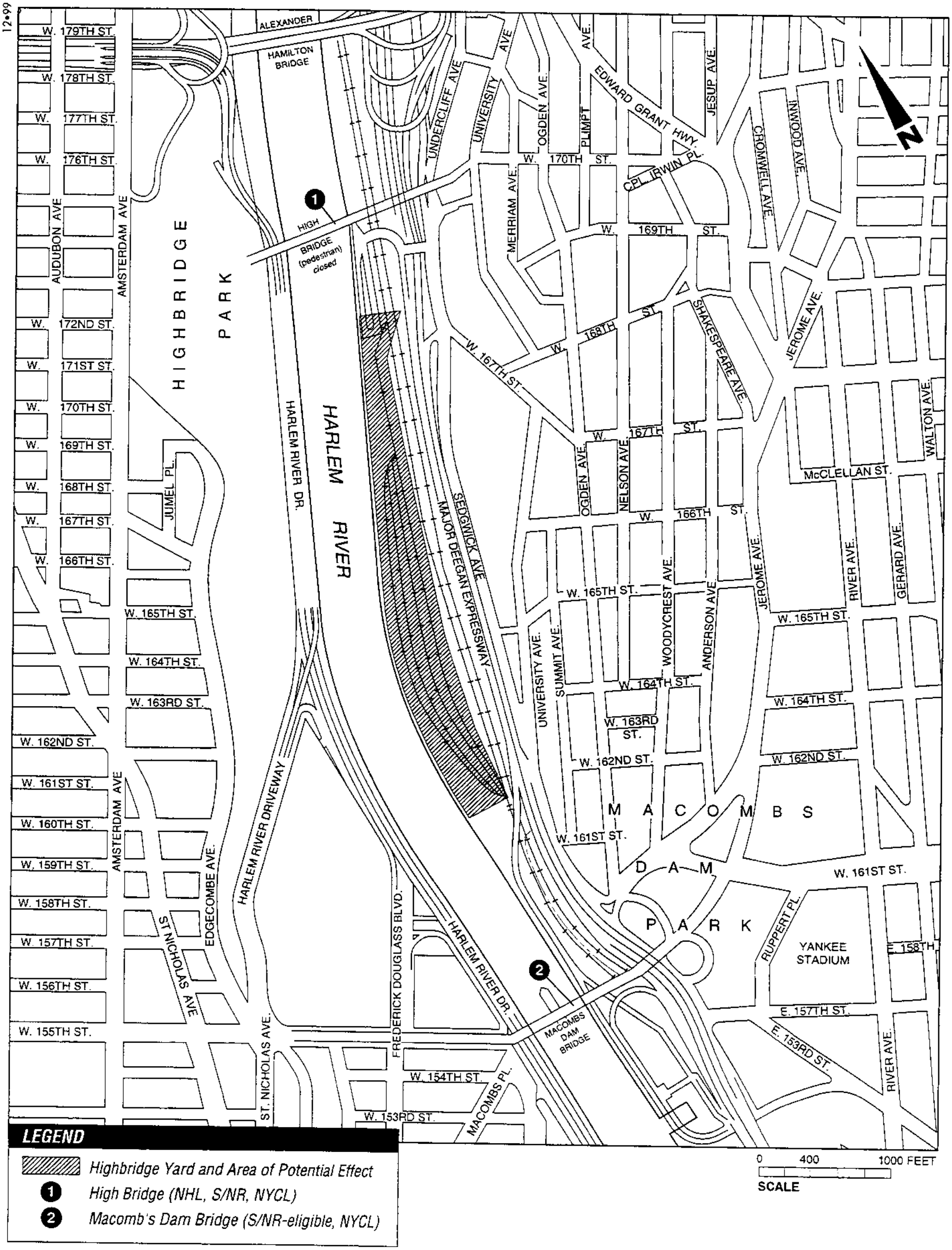

MTA / LIRR
East Side Access

Figure 7-16

Highbridge Yard – Known Historic Resources

The new escalators and elevators in the Biltmore Room and the escalator just outside the room in the Biltmore Concourse proposed for Option 1 would change the visual appearance of these areas, but not significantly alter their historic character. These changes would be minimally visible as these areas are located at the periphery of the terminal and constitute minor visual additions within the larger terminal area. Within the Biltmore Room, the escalators and elevators would be new modern elements that would be located at the edge of the room but only take up a small area in a relatively large space. These elements would not be out of character with the other public areas in the Terminal, which consist of a mixture of historic features and new modern amenities, including newly designed stores and installed escalators. In addition, the modern newsstand in the center of the room, which largely obscures views of the room due to its size and placement, would be removed, opening up the room to views of its historic walls and ceiling, and, therefore, providing a beneficial effect. The location of the escalator in the Biltmore Concourse would be in an area lined with modern stores, and in the same area as the already existing escalators that connect the Main Concourse level to the Dining Concourse level at the western end of the terminal. Thus, the installation of an escalator in an area defined by both historic and modern features and anticipated to be of a similar visual character as one that exists nearby, would not be anticipated to have a significant visual or contextual adverse effect on GCT's historic character.

The proposed creation of an LIRR ticketing area would similarly not be expected to cause any adverse visual or contextual impacts. If the east ticketing windows in the Main Concourse are used, no changes would be made to the booths or ticket windows with the exception of the installation of some form of signage. Such a change would be minimally visible. Furthermore, the use of these ticket windows, which are only partially now used, would reuse a significant historic feature of the terminal and would be historically appropriate. If constructed in the area of the new stores along the Shuttle Passageway, the ticketing area would replace newly constructed retail spaces with a facility that would be designed in keeping with rest of the public terminal areas. Though not yet designed, any significant historic architectural features would be retained. The removal of modern stores and replacement with a newly and appropriately designed area, also at the edge of the terminal, would not change GCT's context as both a historic and active train station.

As described above, the LIRR passenger area proposed for Option 1 and new mezzanine proposed for Option 2 would require changes along the north wall of the Dining Concourse level at the entrances to tracks 114 and 117, to provide access from the Dining Concourse level to these areas. It is expected that some or all of these entrances would need to be modified, as these entrances would no longer be providing access to the train tracks and platforms. Any significant decorative features, if located in areas of proposed construction, such as the sculpted foliate arched plaques above the entrances would be retained as part of the project design. Proposed plans would be submitted to SHPO for review and approval during the ongoing consultation process for this project alternative.

It is anticipated that the newly constructed facilities—the LIRR passenger area for Option 1 and mezzanine for Option 2—though proposed outside the existing public terminal areas in the area of tracks and platforms and Metro-North's Madison Yard, would be visible from the northwestern portion of the Dining Concourse level in the vicinity of the proposed entrances to these areas. It is anticipated that the LIRR passenger area would include a waiting area with seating, while the mezzanine proposed for Option 2 would also include stores and would be located below the Dining Concourse level. While these elements would change the appearance of this portion of the terminal by essentially expanding the terminal's public spaces, they would not be replacing any significant historic or architectural features, and would not alter GCT's context as both a historic building a modern train terminal. In addition, since these areas would be added to the far northwest portion of the Dining Concourse level, behind the grand marble stairs that extend from the Main Concourse, they would be isolated from view from the Dining Concourse except when in close visual proximity.

MANHATTAN ALIGNMENT: OTHER HISTORIC RESOURCES

Potential Physical Impacts

As described in Chapter 2 (and detailed in Chapter 17), Option 1 would require that the Racquet & Tennis Club and Lever House be underpinned to allow the new tunnel to pass beneath the basements of these buildings. The buildings would be underpinned to support their foundations so that the tunnel could be constructed. The underpinning would be completed below the surface and proper care would be given to ensure that this underpinning would not result in any adverse impacts to the building fabric. Again, the construction protection plan approved by SHPO would be implemented.

It is not anticipated that there would be any physical impacts resulting from the construction of the new LIRR pedestrian entrances, ventilation facilities, and substations for Options 1 and 2. None of the locations of the five proposed off-street pedestrian entrances for either project option are historic resources. One, however, is proposed in an existing storefront in a building adjacent to the Vanderbilt Concourse Building, a historic resource. The entrance planned at the store at 347 Madison Avenue would be located on East 45th Street at the corner of Madison Avenue. Therefore, although it would be located in a building adjacent to the Vanderbilt Concourse Building, no adverse physical impacts are anticipated, as the proposed entrance would be at a sufficient distance (85 feet) from this historic resource.

With the exception of the proposed ventilation facility at 47 East 44th Street, new ventilation facilities would be located below-grade, under existing streets and within the existing curb lines. Substations would also be underground. As described in Chapter 11, their design and construction would be undertaken so as to avoid any potential ground-borne vibration impacts to historic resources, including the Tennis & Racquet Club and Lever House located on blocks between proposed ventilation facilities. The ventilation facility at 47 East 44th Street would be contiguous to the Yale Club. The current 5-story commercial building on the site, which is not distinguished architecturally or historically, would be razed for erection of the new facility. Since the Yale Club has been determined to be eligible for the Registers, it would be included in the construction protection plan.

Potential Contextual Impacts

Although the off-street pedestrian entrances have not been fully designed, the construction of an entrance in the place of an existing storefront of a non-historic building would not have any adverse visual impacts on the adjacent Vanderbilt Concourse Building.

Once the project is operational, there would be no impacts to historic resources from the below-grade ventilation facilities or substations, since these features would not be visible. Proposed sidewalk gratings and street-level exit maintenance hatches for ventilation facilities and substations, even if located near a historic resource, would be minimally visible and, therefore, would not adversely affect the visual character of the structure nor its context within an urban environment. For the proposed above-ground ventilation facility contiguous with the Yale Club, as project plans proceed, the project would consult with SHPO and adjacent property owners in developing the building's design. It would therefore not be expected to negatively affect or alter the historic character of the adjacent Yale Club.

QUEENS ALIGNMENT

Potential Physical Impacts

Construction of the Preferred Alternative project elements—loop track reconstruction, new Yard A access points and improvements, and new Yard A facilities, including a train washer and service and inspection shop—is not anticipated to have any physical impacts on historic resources, as there are no historic resources located within the APEs. The buildings to be demolished in Queens have been determined not to be eligible. However, based on initial plans, it appears that two historic resources are located within the APEs of the proposed construction activities at Harold Interlocking and the new Sunnyside station (see Figure 7-14). Harold Interlocking tracks may run within 50 feet of the Office (formerly Signal Cabin F), and the proposed northern platform of the new Sunnyside station may be built less than 50 feet from Switch Tower Q (formerly Signal Cabin Q, Yardmaster's Office). Since SHPO has determined those structures to be eligible for the Registers, they would be included in the construction protection plan. Proposed Harold Interlocking construction on the north side of Barnett Avenue between 43rd and 48th Streets would be within 75 feet of the Sunnyside Gardens Historic District. Since the historic district is located on the opposite side of Barnett Avenue, a 60- to 80-foot-wide street, no construction-period impacts are anticipated either from ground-borne vibrations or damage from construction machinery.

Potential Contextual Impacts

It is anticipated that when the project is completed, there would be no adverse impacts to the two historic resources, the Office and Switch Tower Q located in Sunnyside Yard within the project APEs. Proposed visible changes within the existing active rail yard, including construction of new tracks and the Sunnyside station, would not be expected to alter the structures' context within the yard, nor significantly alter the visual character of the yard surrounding the structures.

The possible demolition of the structures along the north side of Barnett Avenue between 43rd and 48th Streets as a result of the proposed Harold Interlocking work would not result in significant adverse effects on the context of the Sunnyside Gardens Historic District. As described above, Sunnyside Gardens is architecturally and historically significant as the nation's first planned community that successfully realized the English garden city concept. Dating from the 1920's and early 1930's, it was built over a decade after the completion of the LIRR tracks and the rail yards at Sunnyside. Therefore, Sunnyside Gardens and the LIRR tracks have historically coexisted. Prior to the construction of the garages and commercial buildings during the late 1950's and 1960's, which are not part of, nor do they relate historically to, the district, there were no structures between the LIRR embankment and Barnett Avenue to act as a buffer. Therefore, while the removal of these structures may affect the views of the residents within the historic district (see Chapter 6, "Visual and Aesthetic Considerations" for further details), their demolition would not in any way alter the qualities of the historic district that give it its significance, nor significantly alter a context that has historically existed since the construction of Sunnyside Gardens.

HIGHBRIDGE YARD, THE BRONX

Potential Physical Impacts

No impacts would occur to either High Bridge or Macomb's Dam Bridge during construction at Highbridge Yard. Both bridges are some distance from the yard and proposed construction area.

Potential Contextual Impacts

Proposed new lighting in Highbridge Yard has the potential to affect views of High Bridge at night. To avoid any impacts on views of this bridge, which is itself lit at night, the new lighting would be designed with shielding so that it illuminates downward. This would avoid potential impacts on nighttime views of the bridge. Macomb's Dam Bridge, located at a greater distance south of the yard, is too far away to be affected by any lighting changes.

F. MITIGATION

As preparation of a Final Environmental Impact Statement (FEIS) and subsequent preliminary engineering proceed, ongoing consultation will be undertaken with the State Historic Preservation Office at the New York State Office of Parks, Recreation and Historic Preservation and with the federal Advisory Council on Historic Preservation. This ongoing consultation is mandated by Section 106 of the National Historic Preservation Act of 1966.

As described earlier, proposed project construction would involve physical alterations to three known historic resources. Option 1 and Option 2 construction activities would be located within the public areas of Grand Central Terminal itself and the terminal's track area, and the Racquet & Tennis Club and Lever House would be underpinned to support their foundations for Option 1. Although design specifications would be sufficiently stringent to ensure that no adverse physical effects would occur to these resources, a construction protection plan, to be developed in consultation with SHPO and approved by SHPO prior to the start of construction, would be implemented. To avoid potential contextual effects for work within Grand Central Terminal, any significant architectural or decorative features, if located in areas of proposed construction, would be retained as part of the project design and plans submitted to SHPO for review and approval.

To avoid significant adverse impacts to two historic resources—the Office (formerly Signal Cabin F) and Switch Tower Q (formerly Signal Cabin Q, Yardmaster's Office)—located in Sunnyside Yard within the APE, and possibly in proximity to, the proposed Harold Interlocking work, and new Sunnyside Station, respectively, these structures would be included in the construction protection plan to be approved by SHPO prior to the start of construction.

In addition, the proposed construction of an above-ground ventilation facility adjacent to the Yale Club in Manhattan could affect this historic resource. To avoid potential physical effects, it would be included in the construction protection plan to be approved by SHPO prior to the start of construction.

G. SOURCES CONSULTED TO IDENTIFY POTENTIAL HISTORIC RESOURCES[*]

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[*] Selected list including only major sources.

A. INTRODUCTION AND METHODOLOGY

This chapter assesses the potential impacts of the Transportation Systems Management (TSM) Alternative and the Preferred Alternative on archaeological resources. It begins with an evaluation of project areas that may contain buried archaeological resources. Specifically, the analysis focuses on areas where construction activities associated with project alternatives would disturb the ground, and therefore could affect archaeological resources if any are located there. Once potential archaeological resources have been identified, the chapter then considers the alternatives' effects on those potential resources. Because any archaeological resources present would be affected by construction rather than operation of the project alternatives, this chapter includes a detailed evaluation of construction impacts.

As described in Chapter 7, "Historic Resources," Section 106 of the National Preservation Act of 1966 and the New York State Historic Preservation Act of 1980 both require government agencies (federal and state, respectively) to consider the effects of their actions on any properties listed on or determined eligible for the State and National Registers of Historic Places (S/NR). The National Environmental Policy Act (NEPA) also requires such consideration.

Properties listed on or determined eligible for the National and State Registers can include both historic resources (described in Chapter 7, "Historic Resources"), and also archaeological resources. Because of the long history of activity in parts of the study areas, archaeological sites containing artifacts, features, and architectural remains may be buried in the project areas. Many of these locations that once contained archaeological resources have since been disturbed or destroyed by later grading, excavation, installation of utilities, construction of subway lines, and other development activities. In some locations, however, archaeological resources may remain. If present, these could provide information about the early history of Manhattan, Queens, and the Bronx, and therefore may be eligible for listing on the State and National Registers of Historic Places.

The No Action Alternative involves measures that are available to the Long Island Rail Road (LIRR) as routine management and do not require a major new construction effort. The No Action Alternative would therefore not result in any significant adverse impacts to archaeological resources, and it would not require analysis of archaeological resources.

Construction of portions of the TSM and Preferred Alternatives has the potential to disturb archaeological resources, if present, in locations where subsurface excavation would occur. Therefore, documentary research was undertaken by professional archaeologists to determine whether locations that would be disturbed for the project alternatives could contain archaeological resources. That research is summarized here and presented in full in an appendix to this EIS.*

As detailed below, the archaeological study encompassed five steps:

- Definition of the Area of Potential Effect (APE). This is the area where project activities could disturb the ground enough so that if any archaeological resources are present, they could be affected. The APE is the study area for archaeological resources.
- Preliminary determination of the likelihood of encountering archaeological resources within the APEs. This determination is based on documentary research undertaken to identify any possible archaeological resources within the APEs.
- Documentation of disturbance and identification of potential undisturbed resources. For each area where possible archaeological resources were identified, the site history was studied to identify construction activities and other ground disturbances that may have disturbed or destroyed any potential archaeological resources in the past. The result of this assessment was an inventory of potential archaeological resources that may remain in the APE.
- Assessment of impact. The project alternatives' effects on the potential archaeological resources identified were then assessed. Any archaeological resources present would be affected by construction rather than operation of the project alternatives.
- Identification of mitigation. For all potential significant adverse impacts identified, mitigation measures were identified.

Each of these steps is described in more detail below.

DEFINITION OF THE AREA OF POTENTIAL EFFECT (APE)

Areas of Potential Effect (APEs) and project components that would not cause subsurface disturbance extensive enough to cause potential harm to archaeological resources for the Preferred Alternative were identified in consultation with the State Historic Preservation Office (SHPO) at the New York State Office of Parks, Recreation and Historic Preservation (OPRHP). Definition of APEs are described below and range from no potential impact (no APE) to areas where ground disturbance in the form of new excavation or other subsurface disturbance may affect any archaeological resources, if present. The APEs where archaeological resources could be affected by the project elements are the areas to be studied in the analysis.

TSM ALTERNATIVE

Project elements as currently proposed for the TSM Alternative in Queens, including creation of a covered walkway between the Long Island City station and East River ferry terminal in Long Island City, enlargement of an existing slip at the ferry terminal, and construction of a flyover ramp and on-ramp along the Long Island Expressway (LIE) right-of-way, would not be anticipated to have adverse impacts on archaeological resources, and, therefore, no APEs were determined for these project elements. The areas of proposed construction for the walkway and within and around the existing ferry slip were previously analyzed as part of a separate and unrelated project. Archaeological assessments prepared by Historical Perspectives, Inc., *Hunters*

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* *MTA/Long Island Rail Road East Side Access Project, Stage 1A Archaeological Assessment*, prepared by Historical Perspectives, Inc., October 1999.

Point Phase 1A Archaeological Assessment Report (June 1988) and *Archaeological Assessment of the Hunters Point Project Secondary Study Area* (January 1990), concluded that the affected areas are not archaeologically sensitive for either prehistoric resources or historic resources. Construction of the LIE flyover ramp would take place on an existing elevated portion of the highway, and therefore would have no subsurface impacts. Construction of the new on-ramp would occur on the existing roadways of the LIE and its service road, and on a narrow, previously disturbed portion of the elevated embankment between the LIE and the service road. Therefore, these elements would not be expected to have any adverse impacts on any potential archaeological resources, and APEs have not been defined.

Construction of the TSM Alternative's pedestrian bridge between the LIRR station and subway at Hunters Point Avenue would have the potential for subsurface impacts. Therefore an APE for this element was identified and evaluated in the Stage 1A Archaeological Assessment prepared by Historical Perspectives, Inc. The location of this bridge is in an area that could also be affected by the Preferred Alternative.

PREFERRED ALTERNATIVE

For the Preferred Alternative (Options 1 and 2), APEs were defined for locations where the project would affect soil during construction activities. For both project options, no potential for impacts exists for work to be performed within the existing 63rd Street tunnel in Manhattan, or where deep tunneling would occur through bedrock, including the new tunnel to be built between 63rd Street and Second Avenue to Park Avenue at approximately 56th Street. In addition, areas of no impact include locations that have been previously disturbed by tunnel excavation and construction, such as within the Grand Central Terminal (GCT) complex in and beneath the existing rail yard and lower track level and existing tunnel under Park Avenue, and where track work or replacement in the rail yards in Queens and the Bronx would occur but would not be deep enough to disturb areas that were not previously disturbed by construction activities for those existing rail yards. Similarly, for Option 1, the excavation in bedrock for the lower level loop track would not affect archaeological resources.

APEs were defined where construction would cause disturbance from the ground surface down into potentially sensitive areas. In Manhattan, for Option 1 these include the area of the new tunnel west of Park Avenue between 52nd and 55th Streets, new pedestrian entrances, and new ventilation facilities (see Figure 8-1). Option 2 project elements that could cause disturbance in potentially sensitive areas include the locations of new pedestrian entrances and ventilation facilities (see Figure 8-1). For both options, APEs were defined where excavation and soft ground tunneling techniques would be used for construction of project elements at the rail yard complex in Sunnyside and at Harold Interlocking in Queens (see Figure 8-2); where a new substation would be built on Roosevelt Island (see Figure 8-3); and where new structures would be erected and utility lines laid in the rail yards. Since the precise locations of the proposed utility lines in Blissville, Maspeth, and Fresh Pond Yards and of project elements in Highbridge Yard have not yet been designed, the APEs have been conservatively defined as the entire yards (see Figures 8-4 through 8-7).

DETERMINATION OF THE LIKELIHOOD OF ENCOUNTERING ARCHAEOLOGICAL RESOURCES WITHIN THE APEs

PREHISTORIC POTENTIAL

Before Europeans arrived in New York and continuing into the 18th century, Native Americans (American Indians) lived throughout the region. Upland well-drained land in proximity to fresh water was used by Native Americans for long- and short-term habitation, hunting, and planting. Native American sites that have been identified in the New York City region are typically located on high ground near freshwater ponds, streams, and tidal inlets and coves. Because Native American archaeological sites in the city are extremely rare, any site would be considered extremely valuable. Throughout the New York metropolitan region, prehistoric archaeological resources are typically shallowly buried, usually within 3 or 4 feet of the pre-development surface. As a result, they are vulnerable to disturbance. Documentary research was conducted to determine the likelihood that prehistoric (Native American) archaeological resources were deposited within each APE. To help ensure that no possible sites are missed, any project locations that had appropriate topographical features before development and any locations noted in historic sources as former sites of native American camps, villages, middens (refuse piles, such as shell heaps), etc., are considered potential prehistoric sites unless later activities have disturbed them.

Research was conducted at the New York Public Library; the Westchester County, Bronx, and Queens Historical Societies; and at the Westchester County Archives. Site file searches were performed at OPRHP and the New York State Museum (NYSM) in Albany. Pertinent archaeological reports were also reviewed at the New York City Landmarks Preservation Commission (LPC). Cartographic information, in the form of historic maps and atlases, was gathered to determine whether land forms within each APE were conducive for prehistoric habitation or use. Where available, soil borings were analyzed to determine subsurface conditions.

HISTORIC-PERIOD POTENTIAL

Buried remains from the historic period can also be important, because of the new, undocumented information they can provide about the daily lives of previous inhabitants or about important historical events. In the New York City area, historic-period archaeological resources can range from early Dutch colonial artifacts (17th century), to Revolutionary War-period remains, to 19th century residential remains. Industrial remains can also be important. Types of historic archaeological resources that may be present in the New York City region include artifacts relating to dwellings, workplaces and schools, which are often preserved in privies, cisterns or wells prior to the construction of municipal services—namely sewers and water lines. These types of features are often encountered on residential lots, due to their depth (to approximately 8 feet), which have the potential to remain undisturbed by subsequent construction and protected under more recent fill levels. Other commonly occurring, but more shallowly buried, historic remains include foundations and builder's trenches, as well as more fragile backyard features such as fence lines, paths, and traces of landscaping. Cartographic and documentary research was also completed at the above described research locations to reconstruct the historic development of each APE and determine the likelihood that historic features exist within each APE. Historic structures and landforms were noted and areas of potential sensitivity within each APE were identified. Following completion of the background research, field visits were

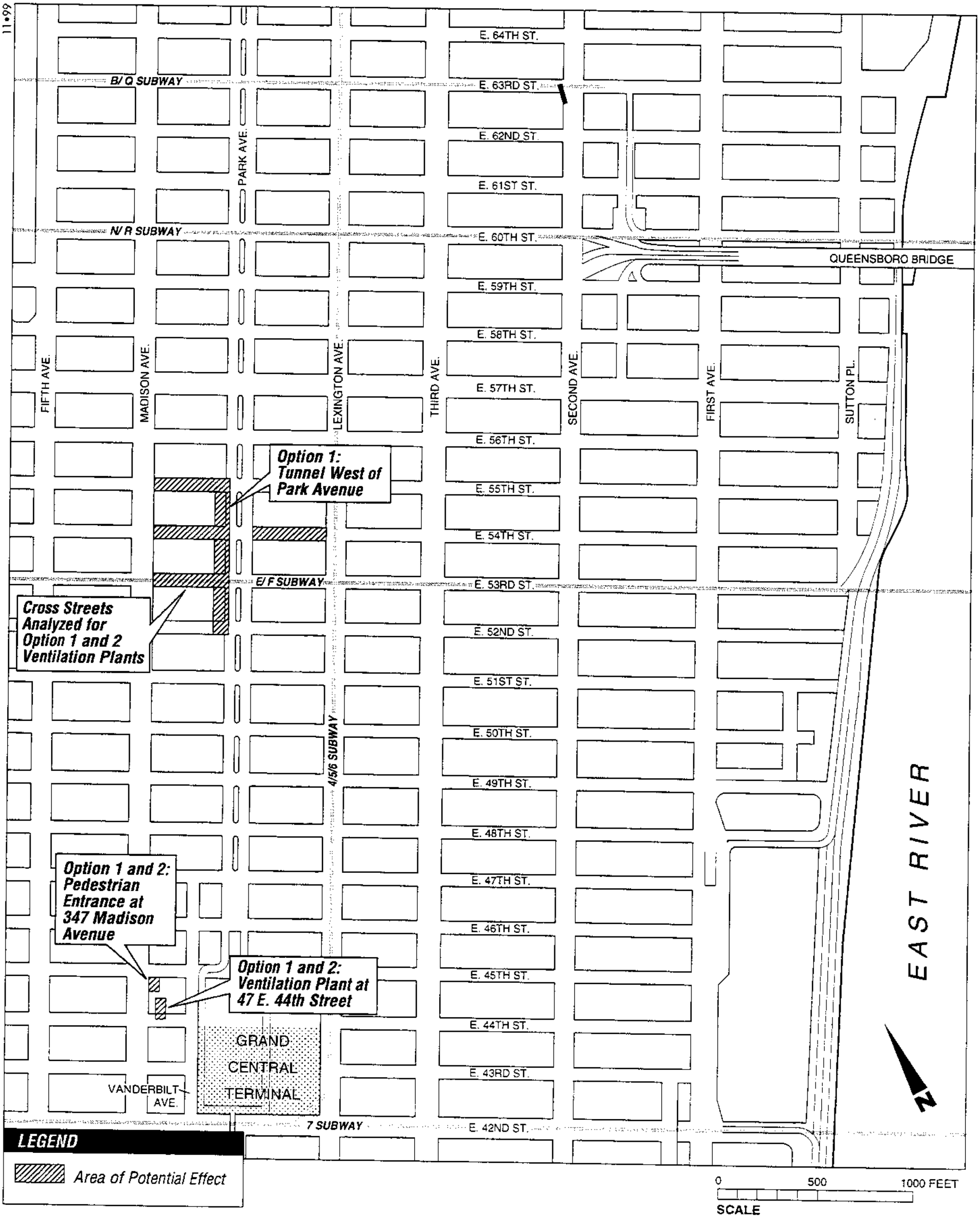
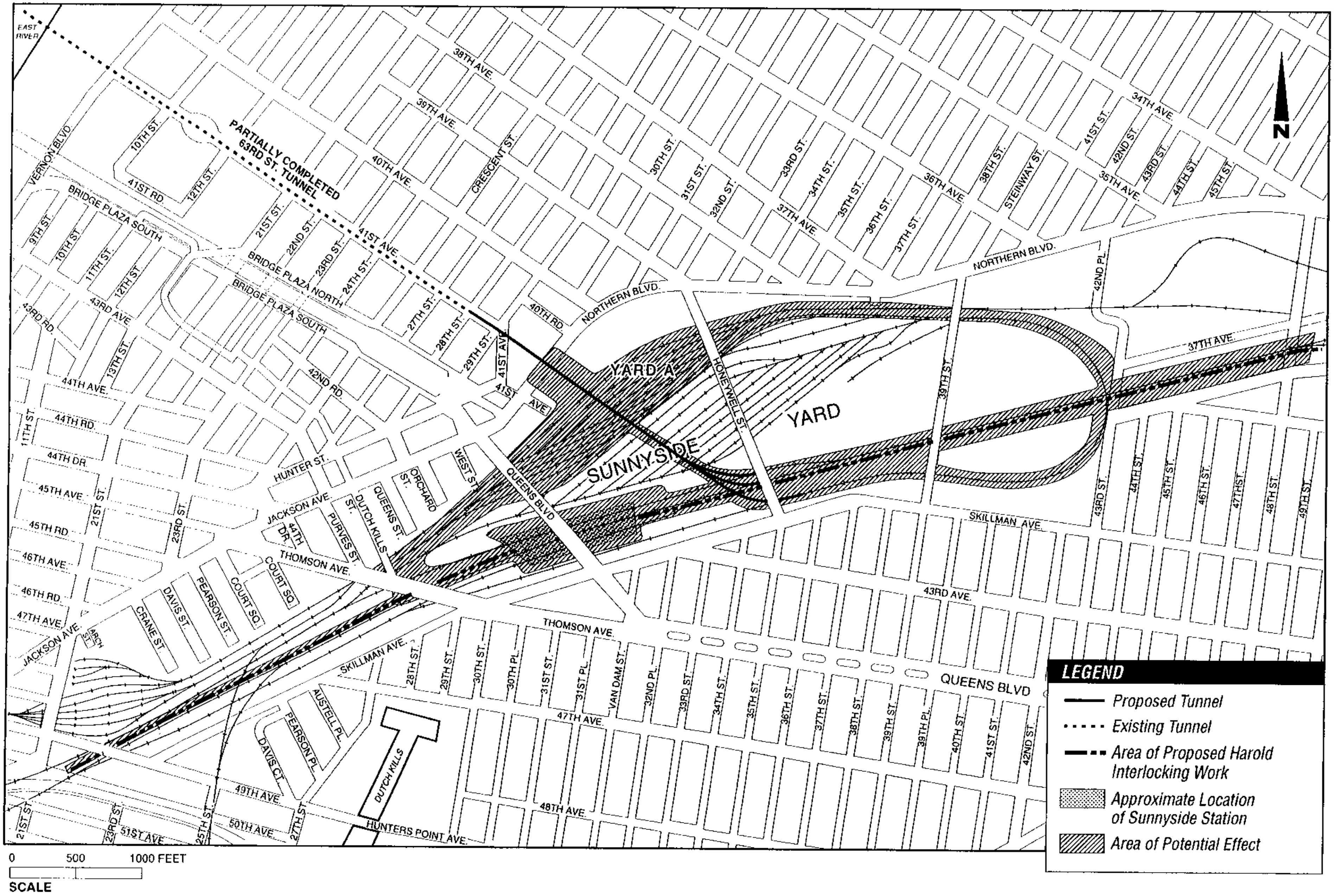


Figure 8-1

Manhattan Alignment Options 1 and 2 Areas of Potential Effect – Archaeological Resources



MTA / LIRR

East Side Access

Figure 8-2

Queens Alignment and Area of Potential Effect – Archaeological Resources

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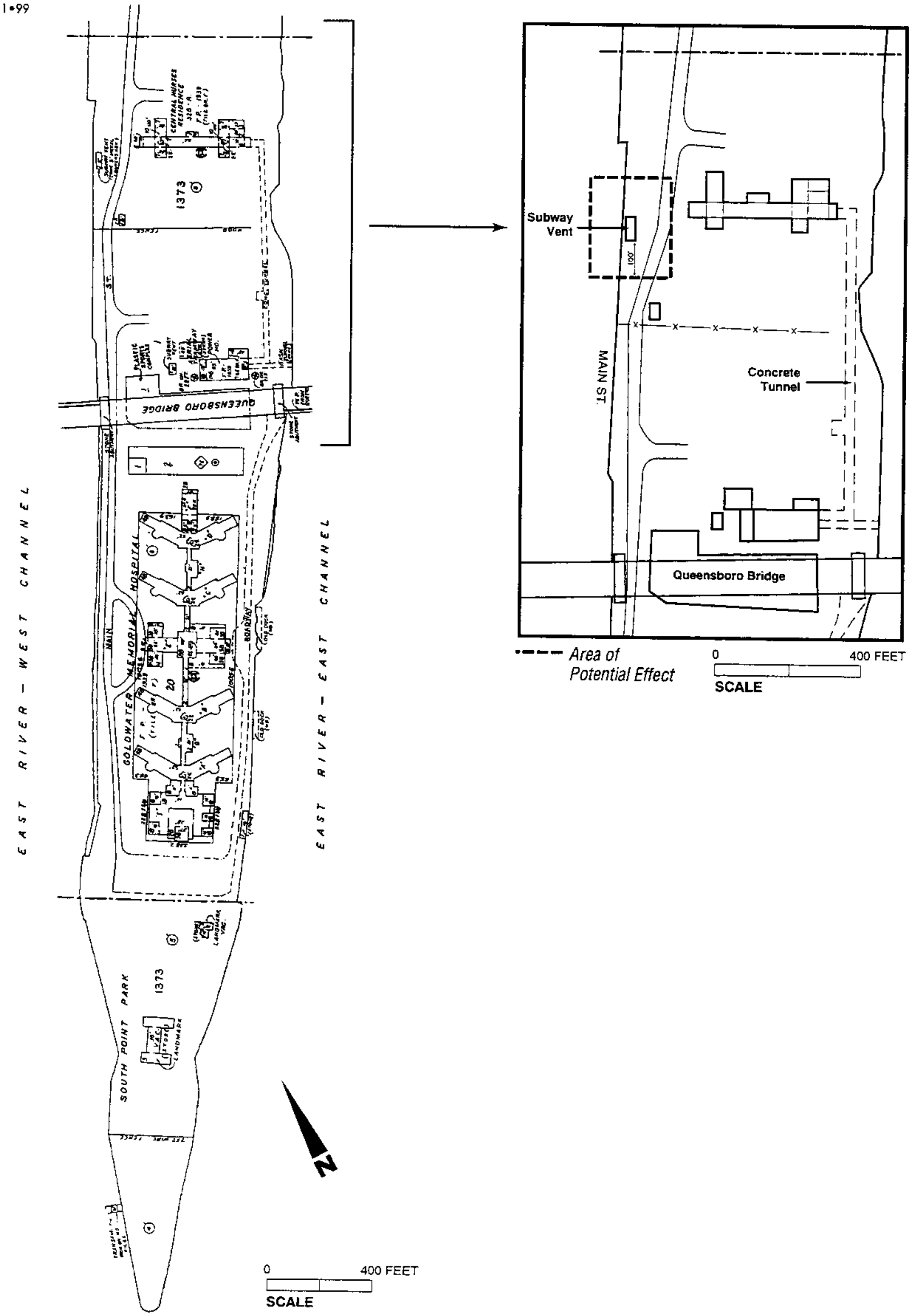

Figure 8-3

Roosevelt Island Area of Potential Effect – Archaeological Resources

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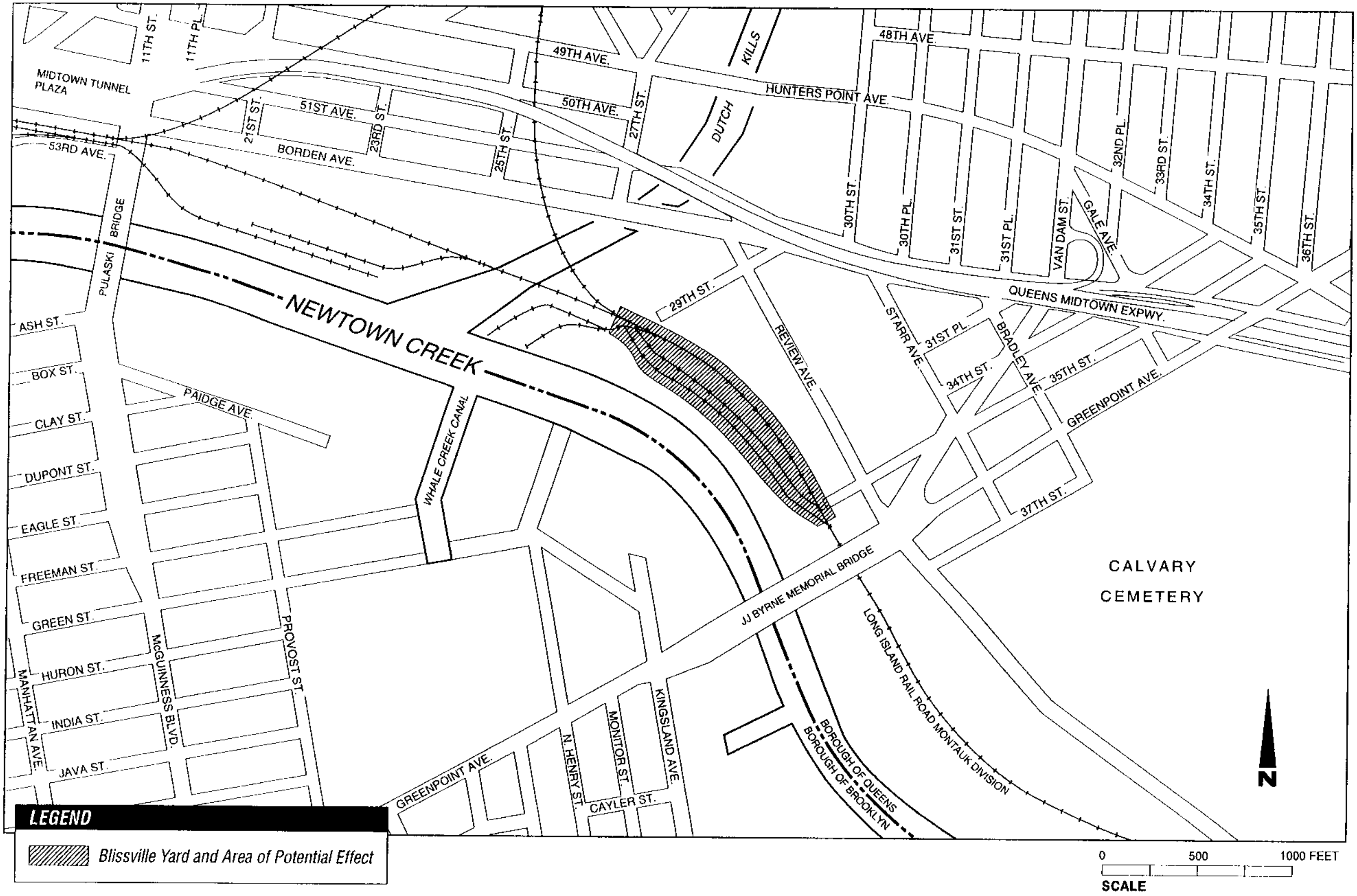

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East Side Access

Figure 8-4

Blissville Yard and Area of Potential Effect – Archaeological Resources

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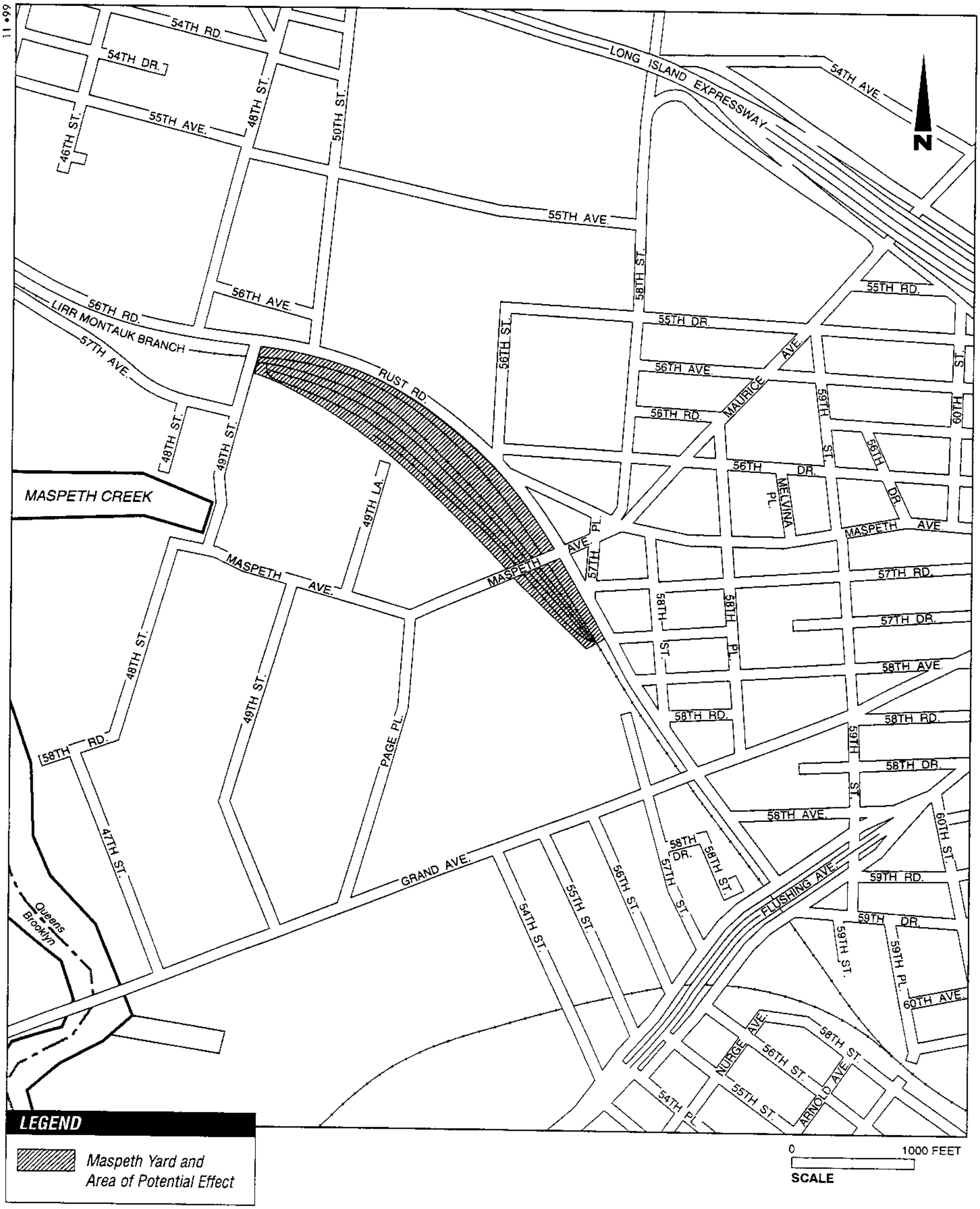

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East Side Access

Figure 8-5
Maspeth Yard and Area of Potential Effect – Archaeological Resources

for significant impacts. APES rated as having moderate or high potential for containing archaeological resources are described below.

MANHATTAN ALIGNMENT

PROPOSED TUNNEL WEST OF PARK AVENUE BETWEEN EAST 52ND AND 55TH STREETS; PROPOSED VENTILATION FACILITIES ON EAST 53RD, 54TH, AND 55TH STREETBEDS BETWEEN LEXINGTON AND MADISON AVENUES EAST AND WEST OF PARK AVENUE

Potential Resources

Prehistoric Period. Based on early topographic conditions prior to development, LPC has identified this APE as potentially sensitive for prehistoric resources. This sensitivity is based on the presence of elevated areas in proximity to fresh water sources. However, historical topographic maps conflict as to the location of the stream, and whether the area was well-drained with fresh water close enough for use by Native Americans, or marshy and, therefore, not conducive to habitation. Consequently, before taking into account any disturbance activities, this area has a low to moderate potential for containing prehistoric resources.

Historic Period. Documentary and cartographic research indicates that no historic structures or features were present on the East 52nd, 53rd, 54th, and 55th Street roadbeds, and no historic archaeological resources are anticipated. Between the streets, the blocks between East 52nd and 55th Streets on the west side of Park Avenue were subject to extensive late 19th and 20th century development, which would not have resulted in archaeological resources and which would have disturbed any resources that could have been present from previous uses (see also below).

Documentation of Disturbance/Identification of Potential Undisturbed Resources

Some degree of grading and/or filling occurred on East 52nd, 53rd, 54th, and 55th Streets prior to the streets being regulated and opened. It is likely that upland areas were leveled and low-lying marshes were filled. Subsurface sewer, water, gas, and electrical utilities are also buried beneath these roadbeds.

East 52nd Street was completely disturbed by the construction of GCT's two-level track network in the early part of the 20th century. The blocks between the East 52nd and 55th Street streetbeds west of Park Avenue have undergone several periods of construction with large buildings, some with below-grade parking garages and most with basements, currently on the site. All buildings would have required massive foundations due to their size. The depths of excavations required for the basements, parking garages, and foundations would have impacted prehistoric areas. Consequently, there is no sensitivity for prehistoric resources for the portion of the APE consisting of the East 52nd roadbed, and the blocks between East 52nd and 55th Streets. The streetbeds of East 53rd, 54th, and 55th Streets are discussed below.

On East 53rd Street, a small ventilation facility for the E/F subway was constructed connecting to street level. However, the subway tunnel itself was built through bedrock and would not have disturbed areas above it. Some areas of original soil may have remained undisturbed above the subway and around the ventilation facility. On East 54th Street, borings completed within the streetbed directly west of Park Avenue indicate fill levels extending between 12 to 20 feet below grade, consisting of sandy silt, with no evidence of organic materials. The lack of organic material and depth and content of fill suggest, respectively, that there is little chance that Native

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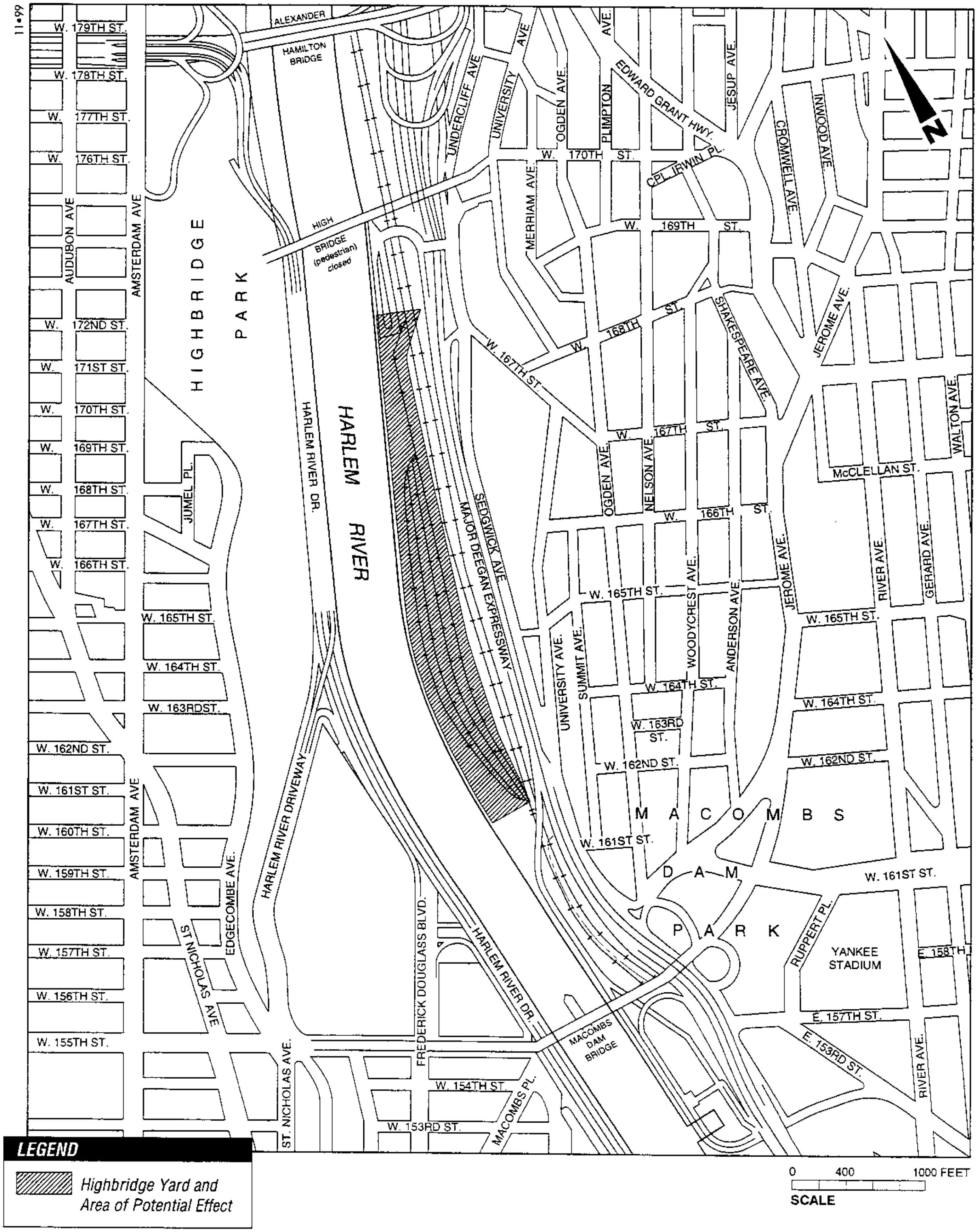

MTA / LIRR
East Side Access

Figure 8-7

Highbridge Yard and Area of Potential Effect – Archaeological Resources

- New York State Museum #4538 (ACP* Queens #—no number assigned): This refers to a village site in Long Island City. The location provided by NYSM includes the entire yard complex and surrounding area—from the rail yard complex on the southeast to 12th Street on the northwest. Therefore, this village site may potentially be within the project area or immediately adjacent to it.
- New York State Museum #4537 (ACP Queens #14): This refers to a burial site in Long Island City. Archaeologists differ on the placement of the site, placing it either on or northeast of Broadway, or on or near Crescent Street. Though not precisely located by NYSM, the site may either be 6,500 feet from the project area, or overlap at the northwestern edge of the rail yard complex and extend to 11th Street on the northwest.

As described above, due to the lack of clarity and age of the sources from which sites are identified or located, the above sites only serve as indicators of potential sensitivity.

Prehistoric topographical conditions in the project area would have been conducive to use by Native Americans. The project area consisted of marsh, salt meadow, and elevated knolls, interspersed with ridges and wooded areas on and surrounding the project area. However, while the marshes that once existed east and west of Hunters Point Avenue, and extending east to Queens Street, would have been attractive hunting and gathering locations for native peoples, it is unlikely that any campsite, settlement, or processing area would have been located within the marsh. Instead, these would have been established on nearby dry, elevated land. Therefore, although the project area may have been utilized by Native Americans, types of occupation would have varied depending on the topographical conditions. Consequently, before taking into account any disturbance activities, the APE has varying levels of sensitivity throughout the project area.

Historic Period

The earliest recorded European residents in the vicinity of the project area were in the Dutch Kills area, to the west of the project site. There were few roads in the vicinity of the project area, which was isolated from the rest of Long Island. Crops were transported to New York City markets on boats on the East River, or from a wharf on the current Court Street, down Dutch Kills and Newtown Creek to the East River. By the time of the Revolution, there were a few isolated farmsteads, clustered along a road that ran between the current Skillman Avenue and Northern Boulevard. British forces occupied northwestern Queens from 1776 until 1783. Middleburg Road, which formerly ran diagonally through the center of the rail yards to the east of the current Honeywell Street viaduct and continued southeasterly past the current boundaries of the yard, was the chief communication and transportation route between east and west, and the eastern section of the yards and areas farther east were heavily manned with British troops, with soldiers bivouacked in huts and tents and on farms and fields along the road. Even until the 1880's and 1890's, some of the huts were still visible, and there were regular reports of farmers plowing up Revolutionary War relics.

During the 1880's and 1890's, many of the farms on the site of the future rail yards were subdivided. By 1891, more than 100 small frame and brick houses had been built on the site of the undertaken at each APE. At this time, obvious signs of disturbance were recorded and historical features were noted.

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* Archaeologist Arthur C. Parker's research into the known prehistoric sites of New York State identified a number of sites within New York City in his 1920 publication, *The Archaeological History of New York*. These are given numbered designations (ACP #). The New York State Museum locates these sites based on Parker's maps.

For both prehistoric and historic studies, contextual overviews were created based on the background research. These provide a framework in which to interpret potential prehistoric and historic resources and to understand the development history of each APE.

Based on information gathered from documentary and cartographic research and site visits, a preliminary evaluation of the likelihood of encountering archaeological resources was rated as low, moderate, or high for each APE. The results of this research are summarized below under "Existing Conditions."

DOCUMENTATION OF DISTURBANCE AND IDENTIFICATION OF POTENTIAL UNDISTURBED RESOURCES

In conjunction with establishing potential archaeological sensitivity, documentary and cartographic sources were reviewed to identify areas where later activities may have disturbed the soils and therefore any archaeological resources present there. Activities such as grading, landscaping, utility installation, and other similar activities that could have disturbed buried resources were documented. Where available, existing boring logs were reviewed, and topographic maps were compared to current elevations to determine what changes to the landscape have occurred through grading and/or filling. Based on levels of disturbance, the potential of the APEs to contain archaeological resources (identified by ratings of low, moderate, or high) was adjusted to identify sites that, based on their original topography and later development, are still determined to have the potential to contain intact archaeological resources. Such sites are referred to as potentially archaeologically "sensitive." The results of this research and the potentially archaeologically sensitive areas in the study areas are described below in "Existing Conditions."

ASSESSMENT OF PROJECT IMPACTS AND IDENTIFICATION OF MITIGATION

For each area that was identified as archaeologically sensitive, the project alternatives' potential for significant adverse impacts to archaeological resources was assessed, and mitigation measures developed. The results of these steps are described later in the chapter under "Probable Impacts of the Project Alternatives," and "Mitigation Measures."

B. EXISTING CONDITIONS

There are no archaeological sites listed on the S/NR located within the APEs. Possible archaeological sites, inventoried by the New York State Museum or otherwise identified by archaeologists, have been identified as potentially within or in close proximity to the Queens alignment and Maspeth Yard APEs, described below. The New York State Museum's identification of these sites and their locations is based on a variety of old documents, which themselves may be unclear or contain conflicting information, and, therefore merely serve as indicators as to the potential archaeological sensitivity of the APEs.

The APEs have been assessed for their potential to contain prehistoric and historic-period archaeological resources, and the archaeological sensitivity of each APE has been rated low, moderate, or high. Areas with moderate and high ratings are considered to have the potential for archaeological sensitivity; in those locations, disturbance by project-related work could result in significant impacts. Areas with no or low sensitivity are not considered to have the potential

- Three areas between the Thomson Avenue and Queens Boulevard bridges as follows: 1) the area that extends along the northern edge of Yard A between the Thomson Avenue and Queens Boulevard bridges is potentially sensitive for prehistoric resources; 2) the small triangular area of tracks bounded by the northern edge of Yard A, Dutch Kills Street, and the Thomson Avenue bridge is sensitive for historic-period resources relating to 18th and 19th century residential lots (including shaft features such as privies, cisterns, and wells); and 3) an area adjacent to and east of Dutch Kills Street and the Thomson Avenue bridge is potentially sensitive for 18th and 19th century historic-period resources relating to residential uses as described above.
- Three areas between the Queens Boulevard and Honeywell Street bridges as follows: 1) the area that extends along the northern edge of Yard A between the Queens Boulevard and Honeywell Street bridges is potentially sensitive in different locations for prehistoric resources and historic-period resources relating to a ca. 1650 grist mill; soil borings indicate that a portion of this area has 10 feet of fill or less; 2) a small area along the proposed tunnel alignment is potentially sensitive for prehistoric resources and has 10 feet or less of fill; and 3) an area along the north side of the proposed Harold Interlocking work and in the area of the proposed new Sunnyside station near the Queens Boulevard bridge is potentially sensitive for prehistoric resources and historic-period resources relating to 18th and 19th century residential lots (including shaft features such as privies, cisterns, and wells).
- Two areas between the 39th Street viaduct and 43rd Street (Laurel Hill Avenue), as follows: 1) a portion of the area proposed for the Harold Interlocking work is potentially sensitive for historic-period resources relating to 18th and 19th century residential lots; and 2) an area adjacent to the western edge of the loop track at 43rd Street is potentially sensitive for historic-period archaeological resources relating to British and Hessian troop occupation during the Revolutionary War.
- The area between 43rd Street (Laurel Hill Avenue) and 48th Street (Gosman Avenue), bounded by 37th Avenue to the north and Barnett Avenue to the south, is potentially sensitive for historic-period resources relating to British troop occupation during the Revolutionary War.

ROOSEVELT ISLAND

POTENTIAL RESOURCES

Prehistoric Period

Although there does not appear to be any documentary evidence of prehistoric sites on Roosevelt Island, since prehistoric sites are documented in Manhattan and Queens not far from the site, it is likely that Native Americans did at some point visit Roosevelt Island. At the time of European contact, the proposed site of the substation was land under water. However, sea levels gradually rose during the prehistoric period as the glaciers of the last ice age retreated, so it is possible that during some prehistoric period the site may have contained habitable land that may have been occupied by Native Americans. Therefore, before taking into account any disturbance activities, this APE (conservatively defined as the area within 100 feet of the existing subway ventilation shaft) has a low to moderate sensitivity for prehistoric resources.

Americans inhabited the immediate area, and that the area was, in fact, low-lying and does not contain the topographic features associated with Native American occupation. Consequently, the East 54th Street roadbed west of Park Avenue has no prehistoric sensitivity. On East 53rd Street, 54th Street east of Park Avenue and 55th Street, while there has been some disturbance, the extent of disturbance is unclear, and some pockets of prehistorically sensitive areas may remain beneath historic fill. Prehistoric resources are rare throughout the city, and particularly in Manhattan. Therefore, these three streetbeds—East 53rd, 54th east of Park Avenue, and 55th Streets—retain a low to moderate sensitivity for prehistoric resources.

PEDESTRIAN ENTRANCE AT 347 MADISON AVENUE AND VENTILATION PLANT AT 47 EAST 44TH STREET

Potential Resources

Prehistoric Period. Historic maps indicate that this APE was well-drained land about one block west of a stream, and, therefore, consistent with Native American occupation. Consequently, before taking into account any disturbance activities, this APE has a moderate potential for prehistoric resources.

Historic Period. No historic structures or features were identified in this APE, with the exception of a small wooden structure that stood on the site at 47 East 44th Street. This structure, built before 1879, was replaced in 1887 by a 5-story brick dwelling with a basement. The brick structure was enlarged with an addition to the rear of the lot in the early 20th century and is still extant.

Documentation of Disturbance/Identification of Potential Undisturbed Resources

Extensive historical development has occurred within the APE, which has been occupied by late 19th century and early 20th century structures with basements. The excavations for these structures would have impacted prehistoric landforms and disturbed any potential resources, if they existed. The East 44th Street roadbed has also been disturbed by the installation of utilities twice —first prior to the construction of the GCT tracks and subsequently after their construction. A retaining wall for the below-grade rail yard was also constructed in this portion of the street. The late 19th century building at 47 East 44th Street would have disturbed any potential prehistoric or historic resources on that site. Therefore, this APE is overall not sensitive for either prehistoric or historic-period resources.

QUEENS ALIGNMENT, INCLUDING PROPOSED TSM ALTERNATIVE CONNECTION AT HUNTERS POINT AVENUE

POTENTIAL RESOURCES

Prehistoric Period

Evidence of Native American utilization within the Queens alignment project area and its vicinity is well documented—OPRHP and NYSM have identified six prehistoric sites in the area. Four of the sites fall outside the boundaries of the project area. Of the two closest sites, one may fall within the boundaries of the yards and one directly adjacent, as follows:

future rail yard complex, including a small hamlet, Sunnyside, built between Northern and Queens Boulevards. By 1903, many houses filled the future yards site, though this neighborhood was short lived. From 1903 to 1905, all the houses were razed and the land was leveled by the Pennsylvania Railroad for construction of the rail yards. In 1909, the viaduct bridges were constructed over the yards and the rail yard complex opened in 1910. Since then, the yard complex, which also contains the LIRR Main Line and Port Washington Branches, has been utilized for railroad operations to the present day.

Due to the large number of farmhouses and other residential properties that once occupied the project area, and before taking into account any disturbance activities, the project area is potentially sensitive for a range of shallowly and deeply buried archaeological resources along the former Middleburg Road, and in the areas of the dwellings erected in the late 19th and early 20th centuries (in the form of wells, privies, cisterns, and foundations) prior to construction of the yard complex. In addition, there is also the potential for resources relating to the British occupation of the area during the Revolution along Middleburg Road.

DOCUMENTATION OF DISTURBANCE/IDENTIFICATION OF POTENTIAL UNDISTURBED RESOURCES

During residential and commercial development of the area beginning in the 1860's and 1870's, meadows were filled in and old roads raised to a higher grade, often using local hills as fill sources. As described above, in the first decade of the 20th century, the Pennsylvania Railroad leveled the area of the future rail yards, filling in low-lying meadow and swamp land, and removing hills within the yard boundaries. An estimated 2.5 million cubic yards of earth were deposited at the meadow at the Dutch Kills headwaters, now the westernmost third of the rail yards, roughly west of the current Van Dam Street.

As described above, prehistoric archaeological resources are typically shallowly buried, usually within 3 to 4 feet of the prehistoric surface, and therefore vulnerable to later construction activities. Therefore, early grading and residential development would have compromised the prehistoric potential of the project area, including the above-described NYSM sites, while subsequent rail yard construction would have affected later historic-period resources. The analysis of the project area—the Queens alignment and area of the TSM Alternative tunnel at Hunters Point Avenue—identified a number of potentially sensitive locations, which have been rated low, moderate, or high based on the potential for containing prehistoric and historic-period resources and depending on levels of disturbance. However, conclusions concerning both sensitivity and impact are based primarily on a comparison of topographic maps that detail land contours along the Queens alignment before and after the Sunnyside Yard and LIRR track construction. Although earlier topographic maps were reviewed, they provided only crude descriptions of topography due to lack of elevation numbers. In addition, disturbance and filling episodes prior to the construction of Sunnyside Yard can only be generally documented.

Taking into account the likelihood of prehistoric and historic-period occupation and subsequent disturbance activity, the following areas were identified as having moderate and high sensitivity for archaeological resources (see Figure 8-8):

- Area of proposed demolition of the warehouse buildings between Northern Boulevard and Yard A (Block 239, Lot 36). This area is potentially sensitive for prehistoric resources. Soil borings indicate that this area has 10 feet of fill or less.

DOCUMENTATION OF DISTURBANCE/IDENTIFICATION OF POTENTIAL UNDISTURBED RESOURCES

Filling episodes that transformed the marshlands and regulated the shoreline may have served to preserve and protect prehistoric resources, if they existed. Land that may once have been used by Native Americans may now be buried beneath soil used to fill in marshlands. Therefore, the yard is considered to have an overall low to moderate potential for prehistoric resources.

MASPETH YARD, QUEENS

POTENTIAL RESOURCES

Prehistoric Period

Reported sites in the area near Maspeth Yard include Native American villages, burial areas, middens, and campsites. Documentary data indicate six prehistoric sites within the surrounding area, and one or two sites located with the yard boundaries, as follows:

- Maspeth (Marshpath): Early 20th century archaeologist and historian Reginald P. Bolton suggests that the area along Newtown Creek was the location of a native village. Further documentary evidence indicates that part of the village site may have been located within the yard boundaries.
- NYSM #4536 (ACP Queens #13): This site has been identified as a village site at the head of Newtown Creek, on the north side close to, or partially within, the yard.

As described earlier, due to the lack of exact site placement, the above sites only serve as indicators of potential sensitivity.

The yard does not appear to exhibit the topographical characteristics preferred by native groups as the area may have been partially inundated land. However, the possibility that existing sites could lie within the yard boundaries and the presence of documented prehistoric sites adjacent to Newtown Creek mean that the area within the yard may have been utilized by native groups. Consequently, prior to taking into account any disturbance activities, the yard has a moderate potential for prehistoric resources.

Historic Period

One historic structure has been identified within the yard boundaries. The Old Town Dock stood along the Newtown Creek from approximately the 1770's through part of the 19th century, and possibly into the early 20th century. No other structural remains or artifacts are anticipated.

DOCUMENTATION OF DISTURBANCE/IDENTIFICATION OF POTENTIAL UNDISTURBED RESOURCES

Review of soil borings conducted at Maspeth Yard to depths between 10 and 16 feet indicated varying levels of fill and sand, demonstrating that the yard had an uneven surface. Specifically, in an area approximately 100 feet south of Maspeth Avenue and 400 feet north of Maspeth Avenue, soil borings indicate a fill layer of only 1 to 2 feet. At this location, the predevelopment land surface was higher in elevation. Since this area was probably well-drained land prehistorically, it is the most likely section of the yard to have been utilized by Native Americans. In other locations within the yard, soil borings indicated that fill ranged from 10 to 13 feet below the surface. However, these borings were not of a sufficient depth determine the final depths of

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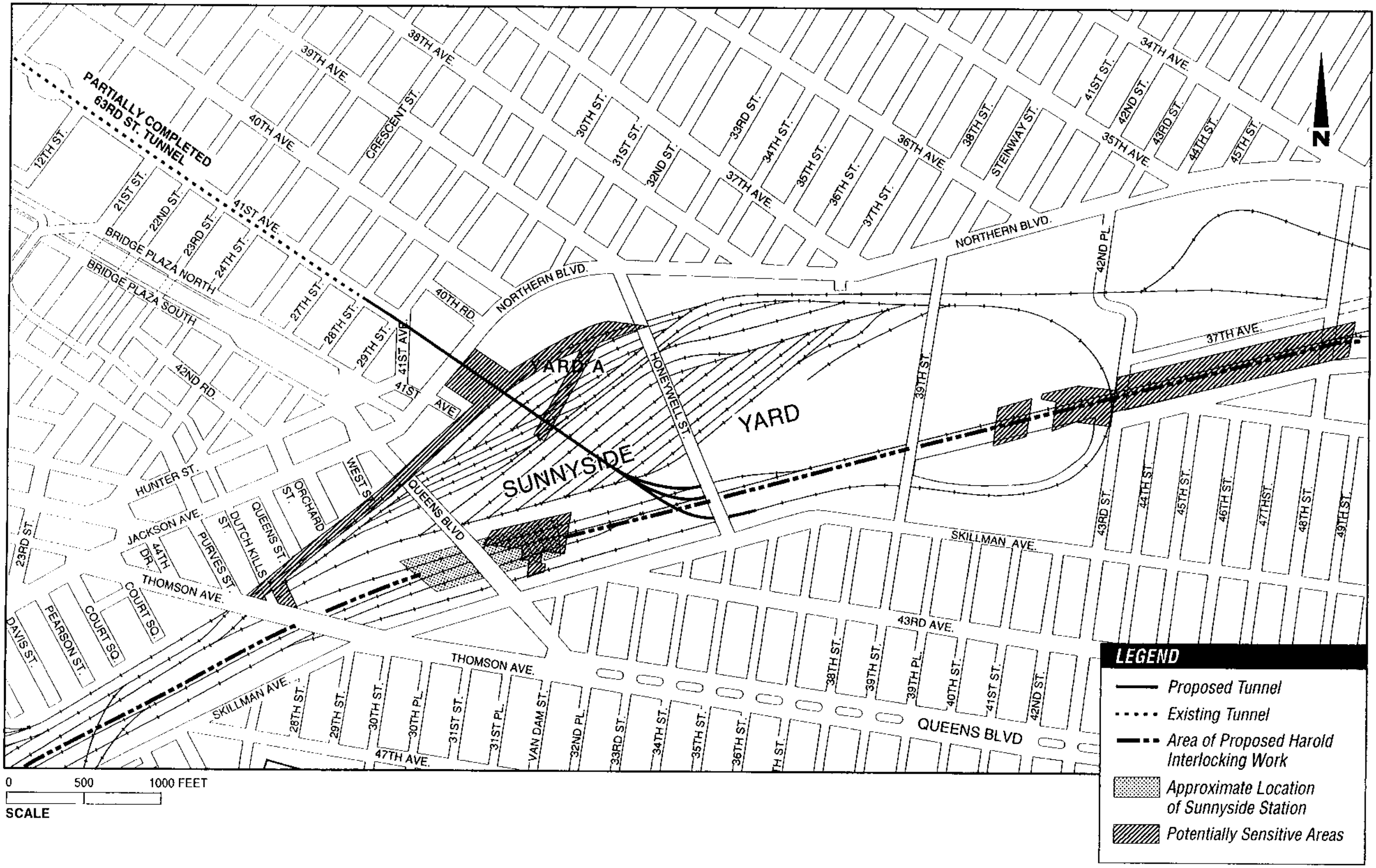

MTA / LIRR

East Side Access

Figure 8-8

Queens Alignment – Potential Archaeologically Sensitive Areas sensitive for prehistoric resources. Therefore, the APE still retains a high sensitivity for prehistoric resources.

HIGHBRIDGE YARD, THE BRONX

POTENTIAL RESOURCES

Prehistoric Period

There are a number of documented prehistoric sites in the area surrounding Highbridge Yard, although there are no sites reported within or in direct proximity to the yard. Prior to historic development and filling, Highbridge Yard was predominantly either inundated by the Harlem River or marsh along its shore. It is possible that the area of the yard experienced periods when it was drained and dry, when sea levels were lower, and at these times the site could have been utilized by Native Americans for fishing and other food procurement. Though the area was probably not inhabited due to its topography, it is possible that shell middens were left along the river's edge. Consequently, prior to taking into account any disturbance activities, the yard has a low to moderate potential for prehistoric resources.

Historic Period

Until the 1860's, Highbridge Yard was either marsh or under water. The yard area was filled to its current western boundary in stages starting in the late 1860's, and concluding in the early- to mid-20th century. Due to the late period of the fill, the fill itself is not considered to have archaeological potential. Commencing in the 1860's, the area of the yard was utilized exclusively by the railroad, and numerous tracks and buildings were built and later demolished in the yard. As described above, the sites of railroad tracks, switching mechanisms, and towers, would not be considered to have archaeological potential as they have been upgraded and removed through time. However, the sites of structures that existed in Highbridge Yard for longer periods of time, such as the carpenter shop and blacksmith shop, among others, and a shorter lived 30-stall roundhouse built to service New York Central's engines, could provide information on railroad technology and its adaptation at Highbridge Yard. Therefore, the locations of these structures, which are expected to be shallowly buried within the fill, have been determined to be potentially sensitive for historic archaeological resources.

DOCUMENTATION OF DISTURBANCE/IDENTIFICATION OF POTENTIAL UNDISTURBED RESOURCES

Any remnants of site usage during the prehistoric period would have first been flooded by the Harlem River and then subsequently covered with landfill during the late 19th and early 20th centuries. Since the yard area was filled in the 1860's, it has experienced extensive railroad development and redevelopment. It is likely that some of this development affected the prehistoric land surface beneath the fill. Borings indicate that the original pre-filling surface was shallower at the southern end of the yard and deeper to the north. Organic levels indicating a prehistorically habitable living surface, including dark grey organic-rich clay and wood, were found only in the northern one-third of the yard, roughly the section north of West 166th Street and between 8 to 15 feet below grade, indicating a prehistorically habitable living surface. Borings for the remaining portion of the yard only yielded sand and gravel layers below the fill, not indicative of prehistoric sensitivity. Footings for 20th century piers along the shoreline in the northern part of the project site would have disturbed this portion of the river bed where prehistoric resources could have existed. Therefore, only the northern third of the yard, commencing roughly at West

Historic Period

As described above, prior to development activities, the proposed site was under water. By 1866, a bulkhead and pier line had been established around Roosevelt Island and the island had been filled to this line. Following the filling of the shoreline along the East River, the proposed site remained undeveloped with the exception of a short-term unidentifiable structure there from approximately 1885 through 1890. Because of the short duration of the structure, it has little research value, and the proposed APE does not have any potential for historic-period archaeological resources.

DOCUMENTATION OF DISTURBANCE/IDENTIFICATION OF POTENTIAL UNDISTURBED RESOURCES

Filling episodes associated with landfill and shoreline regulation in the 19th century may have served to protect prehistoric resources, if they exist. Land that may once have been used by Native Americans would subsequently have been inundated, and then covered by the soil used to create dry land again in the 19th century. In the 1970's, a subway ventilation shaft associated with the 63rd Street tunnel was constructed south and contiguous with the proposed substation site. Although this shaft would have caused some disturbance, undisturbed prehistoric resources may still be located beneath the fill outside its area of impact. Therefore, this APE still retains an overall low to moderate sensitivity for prehistoric resources. The presence of a buried prehistoric surface and the depth of the fill and, therefore, the location of the archaeologically sensitive area, is unclear.

BLISSVILLE YARD, QUEENS

POTENTIAL RESOURCES

Prehistoric Period

The documentary evidence of prehistoric occupation is plentiful in this portion of Queens, with numerous sites recorded along Newtown Creek. Two prehistoric sites have been recorded near the yard—one approximately 400 to 3,000 feet south-southwest of the yard and the other less than 1½ miles to the southeast of the yard. No prehistoric sites have been recorded within the boundaries of the yard. Prior to the historical filling and regulation of Newtown Creek, the area of Blissville Yard was either marshland or inundated by the creek. However, since sea levels rose during the prehistoric period (see discussion above), it is possible that during some prehistoric periods the site may have contained habitable land near Newtown Creek, and may have been occupied by Native Americans. The presence of dry land and the depth of later fill remain unclear. Therefore, prior to taking into account any disturbance activities, this APE has a low to moderate sensitivity for prehistoric resources.

Historic Period

No evidence of early historic farms or other structures within the boundaries of the yard was found during documentary research. Once the marshland was filled and Newtown Creek regulated, the yard was used exclusively by the railroad—an 1873 map indicates that the marshland had been sufficiently filled to support the tracks for the South Shore Rail Road. By 1898, the yard had become a functioning rail yard identified as the "Long Island Rail Road Switch Yards." In addition to the tracks, a few short-term, mostly unidentified, railroad-related buildings also once existed in the yard. However, since the structures were likely not unique or significant, the APE is not sensitive for historic-period archaeological resources.

the analysis conservatively assumes that the project could result in significant adverse impacts to archaeological resources, as described below. Additional analysis of subsurface conditions in the potentially affected areas will be conducted to determine fill levels at such time as details about project design are available. With such information, appropriate mitigation measures will be developed (as described in section E, below) to protect or recover archaeological resources that would be disturbed by construction.

MANHATTAN ALIGNMENT

Within the Manhattan alignment APE, small areas of potentially prehistoric sensitive areas may be located beneath historic fill on East 53rd Street between Park and Madison Avenues, on East 54th Street between Lexington and Park Avenues, and East 55th Street between Park and Madison Avenues. Proposed construction of the Option 1 ventilation facilities on East 53rd Street and on 54th Street east of Park Avenue, as well as on an Option 2 ventilation facility on 55th Street, could impact any resources in these locations. In addition, proposed construction of the Option 1 tunnel west of Park Avenue within these streetbeds could have a significant adverse impact on any resources present in these locations.

QUEENS ALIGNMENT, INCLUDING PROPOSED TSM ALTERNATIVE CONNECTION AT HUNTERS POINT AVENUE

Proposed work along the Queens alignment would cause varying levels of disturbance to areas determined potentially sensitive for prehistoric archaeological resources, including in the locations of NYSM sites #4538 and 4537, and historic-period archaeological resources. The deepest and most extensive areas of impact would be related to tunnel construction through the potentially prehistoric sensitive area located between Northern Boulevard and Yard A, and in two areas between the Queens Boulevard and Honeywell Street bridges that are potentially sensitive for prehistoric and historic-period resources. As described above, these locations have 10 feet or less of fill, so that the original land beneath would be disturbed by the proposed excavation.

In addition, proposed construction of a service and inspection facility within Yard A may affect a potentially sensitive location at the Thomson Avenue bridge. The installation of utility lines within Yard A, for which specific locations have not yet been determined, may also affect potentially sensitive areas, including along the northern edge of Yard A between the Thomson Avenue and Honeywell Street bridges, and an area in Yard A between the Queens Boulevard and Honeywell Street bridges. Even if trenches are dug only to a depth of 5 feet, they may affect shallowly buried prehistoric resources, which as described above, are typically located within 3 to 4 feet of the pre-development surface.

Proposed construction of the new Sunnyside station, including the headhouse and platforms, would affect a potentially sensitive area between the Queens Boulevard and Honeywell Street bridges. Proposed Harold Interlocking work would also affect a potentially sensitive area located between the Queens Boulevard and Honeywell Street bridges, as well as two potentially sensitive areas between the 39th Street bridge and 43rd Street. Proposed loop track work could also affect a potentially sensitive area along the west side of 43rd Street.

In the area between 43rd and 48th Streets, from 37th Avenue to Barnett Avenue, proposed Harold Interlocking work, including embankment modifications and construction of a new viaduct bridge(s), as well as potential new construction along the north side of Barnett Avenue to replace existing structures that may be demolished as part of the proposed project, could also the landfill. Therefore, this APE still has a moderate degree of sensitivity for prehistoric resources that may be buried beneath the fill.

It is likely that if the Old Town Dock stood on the site for more than 200 years, it was upgraded, repaired, and/or replaced during its existence. If the dock stood into the 20th century, it most likely would have been removed or demolished and used as fill in conjunction with the creation of the yard. In any case, a boring taken in the approximate location of the historic dock contained less than 1 foot of fill, and, therefore, the dock would have had little to protect it from disturbance caused by the railroad's use of the site. Therefore, it is highly unlikely that undisturbed and potentially significant remains of the dock exist beneath the surface, and, therefore, the yard is not sensitive for historic resources.

FRESH POND YARD, QUEENS

POTENTIAL RESOURCES

Prehistoric Period

Until the 20th century, prior to historic development on the site, the area of Fresh Pond Yard appears to have been relatively level and wooded. Research indicates that 1930 elevations varied between 85 and 100 feet above sea level, cresting at the northeastern section of the yard. Therefore, the yard's prehistoric topographical features and its proximity to a fresh water source could have made it possible that the site was utilized by Native Americans in some capacity. In addition, Fresh Pond, a fresh water source, was located within approximately 2,000 feet of the western portion of the yard, and about 3,000 feet from the east portion of the yard, making water easily accessible to Native Americans. Consequently, prior to taking into account any disturbance activities, Fresh Pond Yard has a high sensitivity for prehistoric resources.

Historic Period

Through the 19th century, the yard encompassed the back acreage of large farms that bordered Fresh Pond Road, one of the early transportation routes in this part of Queens. The farm structures, which typically included the farmhouse, barn, privy, and other outbuildings, fronted onto Fresh Pond Road, far from the yard. Mid-19th century maps show that the area of the yard was undeveloped woodland. Since it is unlikely that any significant features relating to the agricultural/domestic history of the site would have been located so far from the active farm compounds, the yard has no potential resources relating to these homesteads.

Starting in the late 19th century, the area of the yard was used exclusively by the railroad. Railroad-related resources indicated on historic maps, including tracks, switching and signaling boxes, and towers, are not considered to have archaeological importance since they would have been upgraded and their mechanisms removed as technology advanced. Therefore, the yard is not sensitive for railroad-related historic-period archaeological resources.

DOCUMENTATION OF DISTURBANCE/IDENTIFICATION OF POTENTIAL UNDISTURBED RESOURCES

It is unclear if fill was ever placed on the yard to raise areas for track beds or other railroad uses. If so, it may have preserved and protected prehistoric resources that could be buried below. Although there has been subsurface construction within the yard for installation of utility lines and a jet fuel pipe within the railroad right-of-way, the yard may possess undisturbed areas that are completed and analyzed for this section of the EIS). The results of the proposed borings would be used to determine depths of fill, and, where possible, the sensitivity of the areas to be affected by the proposed project. The proposed soil borings program, described below, would be approved by SHPO prior to start of work.

For the Manhattan alignment, it is recommended that a boring be completed in each cross street —East 53rd, 54th, and 55th Streets—where the new tunnel west of Park Avenue is proposed, and that one boring be completed for each 90 feet of linear impact in the locations of the proposed expansion of the existing ventilation facility on East 53rd Street and proposed locations of the new facilities on East 54th Street east of Park Avenue and East 55th Street between Park and Madison Avenues. For the Queens alignment, it is recommended that soil borings be performed in all areas of sensitivity where soil borings have not already been completed. Continuous soil borings should also be completed in areas of potential sensitivity where proposed construction would take place on Roosevelt Island and in Blissville and Fresh Pond Yards. Soil borings are not recommended at Maspeth and Highbridge Yards, as soil borings analyzed for the project have indicated depth of fill and areas of potential sensitivity.

Upon completion of the soil borings, impacts would be reevaluated based on indication of potential sensitivity. Appropriate mitigation measures would be developed through ongoing consultation with SHPO so that no adverse impact would occur. This may include Stage 1B subsurface archaeological testing in the form of trenching/shovel test pits to investigate the sensitive sections that would be impacted by proposed construction. The testing would be done to locate and identify any potential prehistoric or historic cultural features or deposits. Mitigation may also include Stage 2 resource assessment of National Register eligibility through further study and research. If resources are determined to meet National Register eligibility criteria, Stage 3 data recovery in the form of a full-scale excavation or avoidance of the resources would be undertaken. A Memorandum of Agreement and/or Programmatic Agreement would be executed by MTA/LIRR, SHPO, and, if necessary, the Advisory Council on Historic Preservation, outlining the process and measures to be undertaken to avoid any significant adverse impacts to archaeological resources. ❖

166th Street, has a low to moderate potential for prehistoric resources. The remaining two-thirds of the yard possesses no potential prehistoric archaeological sensitivity.

As described above, specific sites within the yard where past railroad structures once stood are potentially sensitive for shallowly buried historic-period resources, as specific railroad-era features and footprints may lie undisturbed within the fill. Therefore, this APE has sensitivity for both prehistoric resources in the northern third of the yard and an overall sensitivity for historic archaeological resources.

C. FUTURE CONDITIONS COMMON TO ALL ALTERNATIVES

Without the proposed project, any archaeological resources buried in the APEs will most likely remain in place. In streetbed locations, work on utilities and other in-street work could have some additional effect on those resources, as could routine maintenance and repair work in the rail yards. Otherwise, there is no reason to expect them to be disturbed.

D. PROBABLE IMPACTS OF THE PROJECT ALTERNATIVES

As project plans proceed with preparation of a Final Environmental Impact Statement (FEIS) and commencement of preliminary engineering, ongoing consultation will be undertaken with SHPO at OPRHP and with the federal Advisory Council on Historic Preservation, if required. This ongoing consultation is mandated by Section 106 of the National Historic Preservation Act of 1966. As part of the consultation process, additional work will be performed where the potential for significant impacts to archeological resources has been identified, described below. As discussed below, this work will involve the undertaking of appropriate mitigation measures to avoid significant impacts to the extent practicable. The potential impacts associated with project alternatives are described below.

NO ACTION ALTERNATIVE

As described earlier, the No Action Alternative would involve measures available to the LIRR as routine management that would not require major new construction. Therefore, this alternative does not have the potential to affect archaeological resources.

TSM ALTERNATIVE

No areas of potential prehistoric or historic-period sensitivity have been identified in the location of the proposed pedestrian bridge between the LIRR station and subway at Hunters Point Avenue. Therefore, this alternative would have no significant adverse effects on archaeological resources.

PREFERRED ALTERNATIVE

As described above, potentially sensitive prehistoric areas have been identified in all the project APES—the Manhattan alignment, the Queens alignment, Roosevelt Island, and Blissville, Maspeth, Fresh Pond, and Highbridge Yards. Areas of potential historic-period archaeological sensitivity have been identified in the Queens alignment and Highbridge Yard APEs. These potentially sensitive areas are locations where there is some possibility that archaeological resources are buried. In many of these locations, the specific depth of fill materials that may have covered and protected earlier archaeological resources is unknown. In addition, in some locations, the specific depth and extent of project disturbance is not yet known. In all such areas, the No Action, Transportation Systems Management, and Preferred Alternatives; and an identification of measures to mitigate any significant adverse impacts identified.

SUMMARY OF KEY FINDINGS

Since the traffic and transportation analyses conducted for this project were extremely comprehensive and quite detailed technically, a summary of the key findings is provided below. The analyses documented within the remainder of this chapter of the DEIS focus primarily on the potential for significant adverse impacts and measures that would mitigate those impacts, as is the standard procedure for environmental impact studies. The substantial benefits that would be generated by the Preferred Alternative are noted, but are not documented at the same level of detail, as per typical environmental impact study procedures.

REGIONAL TRAFFIC IMPACTS

The Preferred Alternative is expected to bring about 62,300 LIRR riders into GCT during the four-hour weekday AM peak period in the year 2010, and just 5 percent more (about 65,700) in the year 2020. It would also reduce the volume of LIRR riders arriving at Penn Station in the four-hour AM peak period by about 45,700 in the year 2010. Many of these riders into GCT currently take LIRR trains to Penn Station, but a significant volume of new riders would be diverted from their autos. Overall, the Preferred Alternative would reduce total daily vehicle miles traveled (VMT) by about 342,000 in 2010 and by 375,000 in 2020. There would be 11,000 fewer auto trips to work in 2010, and 12,000 fewer trips in 2020.

GRAND CENTRAL TERMINAL AREA

Traffic

The Preferred Alternative would decrease general background traffic in the overall Midtown area by about 2 percent. There would be traffic increases on some streets near GCT due to increased taxi activity there, but there would also be decreased taxi activity in the Penn Station area since LIRR commuters who presently travel to Penn Station and then take taxis to get to their East Midtown destinations could now take the LIRR directly to GCT.

There would be significant traffic impacts at 12 out of the 54 intersections in the traffic study area and significant traffic benefits at 9 intersections in the AM peak hour, 6 significant impacts and 2 significant benefits in the midday peak hour, and 8 significant impacts and 6 significant benefits in the PM peak hour. All significant traffic impacts could be mitigated via standard traffic engineering improvements such as signal phasing and timing modifications, more restrictive parking regulations, and by providing exclusive phases for turning movements at some intersections where there are significant conflicts with high volumes of pedestrians.

The Preferred Alternative would significantly reduce parking demand in Manhattan by approximately 3,000 vehicles or more on a typical weekday.

Pedestrian Flows Within GCT

Under the Preferred Alternative, all pedestrian movements within GCT would function acceptably except for the new escalator bank leading to the vicinity of the NYCT Museum Store on the west side of GCT's upper concourse, and the eastern and western vertical circulation elements leading down to the Lexington Avenue Nos. 4, 5, and 6 subway line. The escalator bank, which operates with one escalator up and one down at all times, would need to be have a significant adverse impact on any historic-period archaeological resources present in this location.

ROOSEVELT ISLAND AND BLISSVILLE, MASPETH, FRESH POND, AND HIGHBRIDGE YARDS

At Roosevelt Island, the construction of a new substation to the north of and adjacent to an existing ventilation facility could adversely affect prehistoric resources. In this location, deeply buried prehistoric resources that were not disturbed by the installation of the existing tunnel vent may exist beneath 19th century landfill.

At Blissville, Maspeth, and Fresh Pond Yards, proposed utility trenches could have a significant adverse impact on prehistoric resources. The specific locations of these trenches have not yet been determined, but it is assumed that they may be up to 5 feet deep. At Blissville Yard, subsurface conditions are unknown and it is not certain if excavations would extend only into fill layers or into surfaces beneath the fill. Therefore, construction activities may disturb soil beneath the fill that is potentially sensitive for prehistoric resources. At Maspeth Yard, the proposed utility trenching could affect prehistoric resources, including possible locations of the reported Marshpath archaeological site and NYSM site #4536, which may fall with the yard boundaries, in locations where fill is less than 5 feet deep—in the area extending from roughly 100 feet south of Maspeth Avenue to roughly 400 feet north of Maspeth Avenue. In the remainder of Maspeth Yard, where fill is deeper than 5 feet, utility excavations would affect only fill levels not considered potentially sensitive for prehistoric resources. Therefore, significant adverse impacts are only anticipated in the area of shallow fill north and south of Maspeth Avenue, described above. At Fresh Pond Yard, the construction of a new maintenance facility anticipated to affect soils approximately 6 to 10 feet below grade in the east part of the yard, in addition to proposed utility excavations, could have significant adverse impacts on potential prehistoric resources buried throughout Fresh Pond Yard.

Work at Highbridge Yard, which would include a variety of construction activities including the erection of new buildings and installation of utility lines (in undetermined locations, but assumed to be up to 5 feet deep) could have significant adverse impacts on prehistoric and historic-period archaeological resources. If construction activities extend beneath the depth of fill, which is approximately 8 feet deep in the northern third of the yard, areas potentially sensitive for prehistoric resources could be impacted. Areas that were identified as potentially sensitive for historic-period resources—the locations of former 19th and/or early 20th century railroad structures—could also be affected by proposed construction elements, with locations and design that have not yet been fully determined.

E. MITIGATION MEASURES

As described earlier, as project plans proceed with the preparation of an FEIS and preliminary engineering, ongoing consultation will be undertaken with SHPO at OPRHP and, if required, with the federal Advisory Council on Historic Preservation. As part of the consultation process, additional work will be performed where the potential for significant impacts to archaeological resources has been identified for the project components.

Once preliminary engineering is under way and the locations of the proposed construction activities have been fully determined, continuous tube soil borings would be performed in all locations identified as potentially significant (where soil borings have not already been

Access project would be fully alleviated since line-haul capacity would be increased on the express and local lines. Line-haul utilization on the Nos. 4/5 express line would be reduced to 0.99 in the AM peak hour and demand levels throughout the 42nd Street station would also be reduced.

The Preferred Alternative would reduce demand levels and crowding on several other subway lines. In the year 2010, there would be 6,000 fewer riders on the northbound, or uptown, A/C/E lines (combined) in the AM peak hour, and about 13,600 fewer riders in the four-hour peak periods. Queuing at stairwells, corridors, token booths, turnstiles, and platforms at the 34th Street station of these lines would all be significantly reduced. Southbound A/C/E ridership would decrease by about 200 in the AM peak hour and 500 in the four-hour AM peak period. There would be improvements on other subway lines as well—1,145 fewer riders on the southbound 1/2/3/9 lines at 34th Street in the AM peak hour, 500 fewer riders on the northbound B/D/F/Q lines, and 1,185 fewer riders on the Manhattan-bound No. 7 Flushing line, and congestion-reduction benefits on other lines and their station facilities as well.

On-Street Pedestrian Flows

Pedestrian paths into and out from GCT were analyzed along with the key streets bordering GCT and adjacent to the new access and egress points (i.e., Grand Central North) opened recently by Metro-North along Park and Madison Avenues. With the introduction of LIRR service at GCT under the Preferred Alternative, pedestrian activity in the area would increase substantially. However, not all of these LIRR commuters are new pedestrians to the area, since many are already there after taking LIRR trains into Penn Station and either walking, taking subways or buses to the area, or taking taxis and then walking to their final destinations.

Detailed pedestrian flow analyses and intersection crosswalk and corner reservoir analyses and midblock sidewalk analyses indicate that there would be significant impacts requiring mitigation at several East Side locations. Some 15-foot-wide crosswalks would need to be widened to 20 feet. At some locations, street furniture and other impediments to pedestrian flow would need to be cleared or limited. This could include sidewalk vendors, newspaper kiosks, and flower boxes, for example. Quick, steady removal of refuse bags that often line sections of sidewalk in Midtown would also be needed.

Buses

Bus ridership projections show that there would be reduced demand for several bus routes that connect Penn Station with the East Side, since LIRR commuters could take direct LIRR service to GCT. There would also be some ridership increases on East Side bus routes by LIRR commuters arriving at GCT who would need to transfer to other routes to get to their final destinations. It is NYCT's policy to adjust schedules and frequencies, within fiscal and operating constraints, as demand dictates.

SUNNYSIDE/LONG ISLAND CITY AREA

The Preferred Alternative is projected to generate 1,530 new LIRR riders in the four-hour AM peak period at its proposed Sunnyside station, and 675 riders in the AM peak hour in the year 2010. There would be 1,300 riders in the PM peak period and 575 riders in the PM peak hour. It is anticipated that 90 percent of these LIRR commuters at Sunnyside would walk to their final destination in the area after alighting from LIRR trains, that 9 to 10 percent would transfer to subways or buses, and that less than 1 percent would take taxis or be picked up or dropped off

A. INTRODUCTION AND SUMMARY OF KEY FINDINGS

INTRODUCTION

This chapter assesses the effects of the project alternatives on regional travel patterns and on specific local components of the region's transportation system—traffic, parking, subway, bus, other commuter railroads, and pedestrian conditions. In terms of regional travel, the project would provide an overall benefit by improving transportation service from Long Island and eastern Queens to Manhattan and Queens. It would provide commuters destined for Manhattan with increased and improved train service—there would be more trains into Manhattan, greater availability of seats, and the flexibility to get directly to the East Side of Midtown Manhattan in addition to the West Side. It would reduce auto commutation into Manhattan as well, by diverting auto trips from eastern Queens and Long Island, to the Long Island Rail Road (LIRR).

At the same time, however, the project could result in localized effects on other transportation elements. These would include the potential for increased traffic at intersections surrounding Grand Central Terminal (GCT), where the number of taxis would increase; these effects would also include increased traffic and parking at LIRR stations in eastern Queens and on Long Island, where the number of riders is projected to increase because of the Preferred Alternative. Other local effects would include increases to ridership on subways serving GCT, and increases to the number of pedestrians in the terminal. However, these increases in pedestrian, subway, and taxi activity at GCT would be offset by decreases in such activity in the Penn Station area, where passenger movements would be less congested, vehicle traffic on the street network would be less congested, and crowding in subway stations and on subway lines would be eased.

The project's effects on transportation are analyzed in the following sections of this chapter:

- *B: Regional Issues*, discussing regional travel patterns.
- *C: Grand Central Terminal Area*, which evaluates the vehicle traffic and taxi pickup and dropoff activity around GCT; pedestrian flows throughout GCT, including connections between LIRR platforms, the Lexington Avenue subway line, and street-level destinations; on-street pedestrian conditions near GCT; and passenger conditions at the 42nd Street Lexington Avenue subway station, including its stairwells, platforms, and line-haul capacity.
- *D: Sunnyside/Long Island City Area*, analyzing vehicle traffic, pickup and dropoff activity, and pedestrian conditions at the new Sunnyside station.
- *E: Eastern Queens and Long Island*, which considers increased vehicle traffic, pickup and dropoff activity, and parking demand at LIRR stations.

Each section includes a discussion of analysis methodologies; an assessment of existing conditions and future conditions common to all alternatives; an evaluation of the probable impacts of another; increasing bus service or heavily subsidizing fares; implementation of new feeder bus services; improving kiss-and-ride facilities to increase pickup and dropoff activity rather than parking; providing preferential parking areas for carpoolers, with enforcement; construction of new stations near or between two major stations where parking demands greatly exceed parking availability; promoting bicycle use; and others. Ridership and parking projections would need to be closely monitored, and the LIRR would need to be ready to implement one or more of these strategies at individual stations.

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operated with both escalators up in the AM peak period and both down in the PM peak period. Operating both escalators in the peak direction would partially mitigate the impact; however, this element would still be over capacity during peak periods. Improvements made at the subway level would help to ease the bottleneck at the Lexington Avenue subway circulation elements. All other existing stairwells, escalators, and concourse corridors and passageways within GCT would not be significantly impacted. The lower level platforms to be used by LIRR trains, and the stairwells, escalators, and cross-passageways serving LIRR commuters to be built as part of the Preferred Alternative, would also all typically operate at acceptable levels of service.

Under certain delay circumstances, conditions in the 47th Street crosspassage would become congested. Option 1 would greatly shorten the time it would take for the 47th Street cross-passage to become overcrowded compared to the No Action condition. Option 2 would have much less of a negative effect, as LIRR riders waiting for delayed trains would have their own large waiting area below.

Lexington Avenue Subway

The Preferred Alternative would add about 2,310 southbound riders and 970 northbound riders to the Lexington Avenue subway line in the 8-9 AM peak hour. Ridership increases in the 5-6 PM peak hour would be about 15 percent lower than the AM increases. All critical elements of the 42nd Street subway station were analyzed including the stairwells and escalators leading from the upper concourse of GCT to the subway mezzanine level, the mezzanine level itself and key fare control areas, the subway platforms, and line-haul capacity on the Lexington Avenue subway.

The detailed analyses show that there are several periods during which some subway station elements would either deteriorate into LOS E/F conditions from conditions better than E/F under the No Action condition, or where there would be further deterioration within LOS E/F conditions expected to be prevalent under the No Action condition. These include the escalator and stairwell bank at the western end of the station leading up to GCT, three stairwells connecting the subway mezzanine level with the subway platforms, and one zone on the subway platform.

New riders generated by the Preferred Alternative would increase line-haul utilization on the southbound Nos. 4/5 express line from 1.12 (12 percent over guideline capacity) under the No Action condition to 1.17 under with the Preferred Alternative in place. This is equivalent to 6 more riders per car per train, on average. Line-haul utilization on the southbound No. 6 local line is expected to increase only marginally from 0.61 under the No Action condition to 0.64 under the Preferred Alternative. The addition of one more express train through this station would be sufficient to mitigate this line-haul impact. This would require improvements to the high subway dwell times created by the high volumes of riders getting on and off at this station.

Mitigation of these impacts includes a number of efforts by MTA New York City Transit to increase the number of trains through the Grand Central Station on the 4 and 5 lines. Coupled with these additional trains, there are several modest capital improvements to the station that would improve the circulation of passengers. All these measures are described in the chapter.

NYCT is considering construction of a new subway line under Second Avenue, with an initial segment from 125th Street to 63rd Street and then linking into the N/R Broadway line's tracks. It is one of three alternatives being considered within its MIS/DEIS process for the Manhattan East Side Alternatives (MESA) study. Should the subway alternative be selected as NYCT's Locally Preferred Alternative and be built, line-haul impacts created by the LIRR's East Side

NYCT service between Manhattan and Queens centers around some key subway lines: the No. 7 Flushing Line, the Queens Boulevard (E, F, and R) lines, and the N train from Astoria, which together bring approximately 85,000 commuters into Manhattan in the peak AM hour. Because of the proximity of its stations to both homes and workplaces, its frequency of service, and its relatively inexpensive cost, residents in Queens tend to commute via subway into Manhattan, even though the LIRR does have a number of stations in Queens.

HIGHWAYS AND BRIDGES

The highways and bridges most important to commuters in the LITC are those that link Manhattan to Queens, Nassau, and Suffolk Counties: three major east-west highways (Long Island Expressway, Northern State/Grand Central Parkway, Southern State/Belt Parkway), and three primary East River crossings (the Queens-Midtown Tunnel, the Queensboro Bridge, and the Triborough Bridge). Currently, all these major routes between Long Island and Manhattan are extremely congested during peak commuting hours, and alternate routes that parallel these major routes have subsequently become extremely congested.

OTHER REGIONAL TRANSPORTATION PROVIDERS

MNR is the commuter rail equivalent to the LIRR north of Manhattan. Second only to the LIRR in size, MNR brings a total of more than 200,000 passengers into and out of GCT each weekday. It provides the only commuter rail services from counties in New York and Connecticut north of Manhattan, and funnels all service from its three main lines—Hudson, Harlem, and New Haven—into GCT.

At Penn Station, and along the tracks between Penn Station and Harold Interlocking in Queens, the LIRR shares space with both Amtrak and NJ Transit. While NJ Transit drops all of its New Jersey passengers off at Penn Station, some of its trains continue on into Queens for storage and maintenance in Sunnyside Yard. Amtrak runs both revenue trains (with passengers) out into Queens as its main route to Boston, and non-revenue trains to Sunnyside Yard, like NJ Transit.

FUTURE REGIONAL TRAVEL COMMON TO ALL PROJECT ALTERNATIVES

As detailed in Chapter 1, "Project Purpose and Need," a number of new transportation projects are in construction or being planned for the region. These include improvements being made by LIRR, MNR, Amtrak, and NJ Transit, among others. With these improvements in place and with the predicted increases in the population and employment in the region, ridership throughout the region will continue to grow in the future.

PROBABLE IMPACTS OF THE PROJECT ALTERNATIVES

RIDERSHIP FORECASTING

This assesses the impacts of the three project alternatives—the No Action, Transportation Systems Management (TSM), and Preferred Alternatives—on the regional and local transportation network. To assess those impacts, a ridership forecasting model was developed to quantify use of the transportation network in 2010 and 2020, for each project alternative. This ridership forecasting model, used by the Metropolitan Transportation Authority (MTA) as part of its long-range planning effort, takes into account a number of factors to predict how people will get to and from home and work in their daily commute, including:

- Future population and employment projections.

by car. Parking would not be provided as part of the station development, and park-and-ride activity is not expected. Significant traffic and transportation impacts are not expected.

EASTERN QUEENS AND LONG ISLAND

The analysis of potential impacts at LIRR stations focused in detail on 15 of the LIRR's 124 stations in Eastern Queens and Long Island. These stations represent the range of all stations, and included several of the busiest stations (Hicksville, Huntington, Ronkonkoma) and others with more moderate usage, stations within local business districts and others closer to residential areas or in fringe areas, stations with multiple bus routes and others with limited service, and stations with extensive parking capacity and others with very limited parking availability. Potential traffic impacts were examined at the 15 representative stations, while parking impacts —determined to be a much larger issue—were evaluated at all stations.

Traffic

The analysis of traffic conditions at a set of 39 intersections at the 15 stations studied indicated that 11 of the intersections would be characterized by significant impacts in the AM peak hour and 13 would have significant impacts in the PM peak hour in the year 2010. Each of the significant traffic impacts could be mitigated via standard traffic engineering improvements, such as the installation of traffic signals at unsignalized intersections that might be impacted, signal phasing and/or timing modifications at signalized intersections that would be impacted, lane re-striping, offsetting centerlines of streets where it would be necessary to gain additional capacity in one direction, and more restrictive parking regulations. These are standard measures within the day-to-day jurisdiction of the agencies responsible for maintaining traffic operations. Since the detailed traffic impact analyses were conducted for a representative set of 15 LIRR stations, it can reasonably be expected that standard traffic engineering improvements would likely be sufficient to mitigate traffic impacts that might occur at the LIRR's numerous other stations.

Traffic analyses were also conducted at eight grade crossing locations as a result of the operation of more LIRR trains through these locations as well as additional vehicle traffic generated by the Preferred Alternative. Impacts at the grade crossing locations analyzed would generally be minimal. At one location—at Executive Drive at the east end of the Deer Park station—significant increases in traffic delays could be partially, if not fully, mitigated by altering the amount of time that the LIRR grade crossing gate is activated and in the "down" position.

Parking

The Preferred Alternative can be expected to increase parking demands at each of the LIRR's 124 stations. Several stations would be able to accommodate the demands, while others would experience significant parking shortfalls (in many cases, parking shortfalls would be expected even under the No Action Alternative).

The range of projected parking shortfalls at the stations analyzed is quite extensive, and mitigation of these shortfalls would need to be individualized on a station by station basis, including one or more of the following measures: expansion of existing lots or construction of new lots or garages; modification of train service and schedules to increase service at stations with available parking or where parking could be added more easily; institution of fare policy changes to attract riders to a new station by shifting one or more stations from one fare zone to

Table 9B-1
LIRR AM Peak Hour Train Arrivals: No Action and Preferred Alternatives

Branch	Penn Station		GCT		Flatbush Avenue		Hunters-point Avenue		Long Island City		All Terminals	
	N/A	Pref.	N/A	Pref.	N/A	Pref.	N/A	Pref.	N/A	Pref.	N/A	Pref.
Port Washington	8	6	0	6	0	0	0	0	0	0	8	12
Port Jefferson	6	6	0	6	1	0	1 (2)	1	0 (1)	0	8 (10)	13
Ronkonkoma	3	3	0	4	1	0	1	0	0	0	5	7
Oyster Bay	2	1	0	0	0	0	1 (2)	1	0	0	3 (4)	2
Hempstead	2	2	0	2	2	2	0	0	0	0	4	6
West Hempstead	1	1	0	0	1	1	0	0	0	0	2	2
Far Rockaway	3	1	0	1	2	2	0	0	0	0	5	4
Long Beach	3	4	0	1	1	1	0	0	0	0	4	6
Babylon	10	10	0	4	8	4	0	0	0	0	18	18
Montauk	3	2	0	0	0	0	1 (4)	1	1	1	5 (8)	4
Total	41	36	0	24	16	10	4 (9)	3	1	1	62(68)	74

Note: ( ) = Peak hour arrivals in TSM Alternative.

FUTURE STATION UTILIZATION

One important result of the ridership forecasting process is the number of trips utilizing LIRR western terminals that would be affected by the project—Penn Station, GCT, Long Island City, Hunterspoint Avenue, and Flatbush Avenue. Essentially, these data summarize how many people would ride LIRR trains in the future under each alternative. For reference, a "base 1995 network" was input into the model, which approximates ridership in 1995. These data, summarized in Table 9B-2, provides a starting point for assessing impacts of each alternative on transportation systems in the western end of the Long Island Transportation Corridor (LITC).

Table 9B-2
LIRR Weekday AM Peak Period Arrivals at New York City Terminals: 2010, 2020

Terminal	2010			2020		
	No Action	TSM	Preferred Alternative	No Action	TSM	Preferred Alternative
Penn Station	103,856	100,348	58,154	110,522	106,849	62,249
Grand Central	0	0	62,334	0	0	65,676
Hunterspoint Avenue	3,260	4,682	514	3,598	5,098	603
Long Island City	44	131	40	46	138	43
Flatbush Avenue	11,374	12,275	9,911	12,144	13,049	10,519
Sunnyside	0	0	2,070	0	0	2,255
Total	118,533	117,435	133,024	126,310	125,135	141,345

B. REGIONAL ISSUES

EXISTING REGIONAL TRAVEL PATTERNS

The Long Island Transportation Corridor (LITC)—including New York (Manhattan), Queens, Kings (Brooklyn), Nassau, and Suffolk Counties—includes approximately two out of every five commuters in the New York Metropolitan area. Each day, more than 440,000 commuters travel from homes in Queens, Nassau, and Suffolk Counties to jobs in Manhattan each day. They do so using four primary modes of travel: LIRR, New York City Transit (NYCT) subways, NYCT and LI buses, and automobiles, each of which is discussed in detail in Chapter 1, "Project Purpose and Need," and summarized below.

In addition to the four primary modes of travel within the LITC, three other regional transportation providers are of relevance to this DEIS discussion: Metro-North Railroad (MNR), Amtrak, and NJ Transit. MNR brings commuters from Connecticut and from Bronx, Westchester, Putnam, and Dutchess counties in New York, into Grand Central Terminal (GCT). NJ Transit brings commuters from a number of branches in New Jersey into Penn Station. Amtrak offers train service from Washington to Boston, through New York's Penn Station.

LONG ISLAND RAIL ROAD

The Preferred Alternative focuses on the LIRR component of the LITC's transportation network. The LIRR transports approximately 270,000 passengers each day and 80 million passengers each year on 10 branches serving 124 stations. With a total of 365 route miles reaching from Penn Station on Manhattan's west side to the eastern tip of Long Island's North and South forks, 120 miles away, the LIRR is vital to commuting on Long Island. Three out of every four trips to work from Long Island to Manhattan are taken via LIRR. Currently, every one of those trips ends at Penn Station, on Manhattan's west side.

Manhattan-bound trains from all ten LIRR branches currently share a single route into Penn Station. After merging at Jamaica and at Harold Interlocking in Sunnyside, trains from all branches move through the dense and crowded network of tracks and switches at Harold Interlocking—an approximately 1.5-mile-long portion of track leading to the East River tunnels—and travel through one of four East River tunnel tracks into Manhattan and Penn Station.

LIRR trains currently share Harold Interlocking with two other rail transit providers: NJ Transit and Amtrak. Together, the combined movements of these three providers comprise one of the busiest interlockings in the entire country, with approximately 66 trains traveling through the interlocking in the AM peak hour. In addition, all LIRR, NJ Transit, and Amtrak trains must use one of four East River tunnels to get from Long Island to Penn Station. Current congestion at Harold Interlocking and in East River tunnels during peak hours has prevented the LIRR from significantly enhancing train service to Manhattan.

NEW YORK CITY TRANSIT BUSES AND SUBWAYS

The NYCT subway and bus system is as vital to residents of Brooklyn and Queens as the LIRR is to residents of Nassau and Suffolk. Serving more than 1.8 billion riders each year, NYCT subways and buses are the most popular, the most convenient, and often, the only means of getting from the homes in the outer boroughs to jobs in Manhattan.

The Preferred Alternative would result in a net decrease in auto trips to work by approximately 11,000 in 2010 and 12,000 in 2020. Overall, the Preferred Alternative would result in an increase in total daily trips of approximately 10,000 in 2010 and 11,000 in 2020. This increase in total daily trips would be due to an increase in drive-to-transit trips that would outweigh the decrease in auto-mode trips. The vast majority of people who switch from driving to work, to taking the LIRR, would still drive to the train station, resulting in one less auto-mode trip and one more drive-to-transit trip. If these new LIRR riders get dropped off at the station in the morning and picked up in the evening, the result would be one less auto-mode trip and two more drive-to-transit trips, accounting for the increase in total daily trips.

In counties where there are no LIRR stations affected by the Preferred Alternative (i.e., outside of Queens and Long Island), there would be no new incremental drive-to-transit trips.

Regional Vehicle Miles Traveled

Total VMT can also be broken down into two subcategories: (1) VMT from auto-mode trips, and (2) VMT from drive-to-transit trips. The Preferred Alternative would result in a net decrease in auto-mode VMT, and a net increase in drive-to-transit VMT, resulting in an overall decrease in total VMT, because mileage reductions from fewer auto-mode trips to work would far outweigh mileage increases from new drive-to-transit trips (that is, trips to work are much longer than trips to train stations).

The Preferred Alternative would result in a reduction in total daily VMT of approximately 342,000 in 2010 and 375,000 in 2020, as compared with the No Action Alternative (see Table 9B-4), and represents a major benefit to the region. This reduction in daily VMT would be spread across all counties in the LITC—Manhattan, Queens, Brooklyn, Nassau, and Suffolk—as well as counties outside the LITC. The greatest daily VMT reductions would occur in Queens and Nassau. Queens VMT would decline due to two factors: fewer Queens residents commuting to Manhattan via automobile, and fewer Nassau and Suffolk County residents driving through Queens on their way to work. Nassau County, situated between Suffolk County and Manhattan, would experience the same effect.

Table 9B-4

Change in Vehicle Miles Traveled: 2010, 2020 No Action vs. Preferred

	2010			2020		
	Auto-Mode	Drive-to-Transit	Total	Auto-Mode	Drive-to-Transit	Total
Manhattan	(41,897)	0	(41,897)	(44,590)	0	(44,590)
Queens	(127,745)	8,336	(119,409)	(138,325)	8,719	(129,606)
Brooklyn	961	0	961	710	0	710
Bronx	(50,923)	0	(50,923)	(54,949)	0	(54,949)
Nassau	(117,720)	12,669	(105,051)	(129,059)	13,816	(115,243)
Suffolk	(37,997)	11,522	(26,475)	(42,832)	13,386	(29,446)
Other Counties	992	0	992	(1,553)	0	(1,553)
All Counties	(374,330)	32,527	(341,803)	(410,598)	35,921	(374,677)

Note: ( ) = reduction in VMT.

- Current commuting preferences.
- The configuration and services provided by the current transportation network: local roads and highways, bus and transit services, commuter rail services, and ferries.
- Current and future transit service fare structures.
- Future improvements planned for the transportation network.
- The operating plans to be implemented under the No Action, TSM, and Preferred Alternatives.

The model represents most regional travel in the New York metropolitan area and, in particular, is designed to estimate trips for the following markets:

- LIRR and MNR commuters to Manhattan.
- NYCT subway and bus customers, particularly those attracted to destinations in Manhattan.
- Automobile travelers from the New York and Connecticut portions of the region to Manhattan who currently choose not to use transit because terminal locations or connections to their destinations are inconvenient.
- Transit customers from New Jersey to Manhattan.

The model uses the New York Metropolitan Transportation Council's (NYMTC's) highway network as a baseline for auto travel and also includes travel by ferry. The model does not, however, include air travelers residing outside New York, automobile travelers to or from New Jersey, trips by taxi, or nonmotorized (walk/bike) trips.

The model uses a geographic area system consisting of the entire MTA service area and includes 12 counties in New York State: New York (Manhattan), Bronx, Kings (Brooklyn), Queens, Richmond (Staten Island), Nassau, Suffolk, Westchester, Putnam, Dutchess, Rockland, Orange; and three counties in Connecticut: Fairfield, New Haven, and Litchfield.

The model was calibrated to produce ridership forecasts for the AM peak period (6-10 AM). AM peak hour, daily, and annual forecasts were derived from the AM peak period analysis. Details of the ridership forecasting methodology and its findings are provided in the Technical Appendix.

OPERATING PLAN

To develop ridership forecasts for the Preferred Alternative, the model used a preliminary 2010/2020 LIRR operating plan for East Side Access. This operating plan* included 36 AM peak hour trains arriving at Penn Station and 24 at GCT. For comparison, a No Action 2010/2020 LIRR operating plan was developed, which included 41 AM peak hour arrivals at Penn Station and none at GCT. In every scenario, each train was assigned to 1 of 10 branches in the LIRR system. In addition, the model incorporated an MNR 2020 operating plan, as well as capital improvements planned for both MNR and the LIRR to develop ridership forecasts for the No Action Alternative. Table 9B-1 summarizes peak hour service for the No Action, TSM, and Preferred Alternatives' operating plans as modeled.

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* Since the ridership forecasting analyses were completed, the operating plan has been modified slightly.

Penn Station Subways

As described in "Future Station Utilization," above, the Preferred Alternative would result in a reduction in LIRR riders arriving at Penn Station in the peak period. This reduction would cause significant declines in LIRR passenger usage of subways in the Penn Station area, as shown in Table 9B-6. The greatest decline would occur on the uptown Eighth Avenue A/C/E trains, which would carry about 14,000 fewer passengers north from Penn Station as a result of the Preferred Alternative.

Table 9B-6

LIRR Passengers Transferring to Subways in the Vicinity of Penn Station: AM Peak Period, 2010, 2020

	2010		2020	
	No Action	Preferred	No Action	Preferred
A/C/E Southbound	8,487	8,015	8,870	8,369
A/C/E Northbound	17,407	3,765	18,432	4,128
1/2/3/9 Southbound	12,354	10,713	13,027	11,383
1/2/3/9 Northbound	2,140	1,944	2,262	2,076
B/D/F/Q Southbound	1,586	1,313	1,684	1,399
B/D/F/Q Northbound	1,069	0	1,107	0
N/R Southbound	763	273	797	285
N/R Northbound	0	0	0	0
Total Transfer to Subway	43,806	26,023	46,179	27,640

Grand Central Terminal Subways

While Penn Station subways would experience ridership reductions as a result of the Preferred Alternative, GCT subways would carry more riders in the AM Peak Period. As described in "Future Station Utilization," above, the Preferred Alternative would bring more than 60,000 new LIRR riders into GCT in the peak period. These new LIRR riders would increase ridership on GCT-area subways, as shown in Table 9B-7. The largest increase in subway ridership would occur on the downtown Nos. 4 and 5 Lexington Avenue express trains, which would carry almost 4,500 more passengers south from 42nd Street (GCT).

SUMMARY

Regional and Local Benefits of the Preferred Alternative

The Preferred Alternative results in a number of substantial benefits to both regional and local transportation systems in the New York metropolitan area. These benefits can best be summarized by looking at the effects of the Preferred Alternative on travel in the AM peak period, when the transportation system is most crowded. The benefits of the Preferred Alternative can be summarized as follows:

- A reduction in daily vehicle miles traveled of almost 342,000 in 2010 and 375,000 in 2020.
- A reduction in the daily number of automobiles using East River crossings of approximately 10,000 in 2010 and 11,000 in 2020.

To assess impacts of each alternative on transportation systems on Long Island, future LIRR ridership was broken out by branch. Each trip destined for one of the LIRR's six (including GCT) western terminals originated on one the LIRR's 10 branches (plus the "City Terminal Zone," which was included as a distinct branch). The model also accounted for non-terminal passengers—those disembarking prior to a western terminal station—and reverse commuters, both of whose trips originate at a western terminal. Table 9B-3 summarizes ridership for each LIRR branch for the No Action, TSM, and Preferred Alternatives (boarding passengers only).

Table 9B-3
Ridership by Branch: Weekday AM Peak Period Boardings, 2010, 2020

Branch	2010			2020		
	No Action	TSM	Preferred Alternative	No Action	TSM	Preferred Alternative
City Terminal Zone*	6,074	6,348	8,223	6,582	6,609	9,040
Babylon	31,854	32,030	33,745	33,872	34,061	35,900
Far Rockaway	7,915	7,929	8,367	8,298	8,308	8,758
Hempstead	5,714	5,792	6,838	6,138	6,154	7,307
Long Beach	7,740	7,747	8,035	8,123	8,129	8,435
Montauk	4,347	4,575	4,411	4,845	5,100	4,915
Oyster Bay	2,979	3,391	2,964	3,145	3,579	3,130
Port Jefferson	32,073	32,893	33,334	34,425	35,342	35,818
Port Washington	17,128	17,358	21,283	18,289	18,189	22,639
Ronkonkoma	17,389	17,395	19,416	19,249	19,254	21,470
West Hempstead	1,765	1,768	2,162	1,849	1,852	2,257
Total	134,979	137,228	148,780	144,814	146,576	159,670

Note: * Includes western terminals and selected Queens stations.

REGIONAL VEHICULAR TRAFFIC

In addition to forecasting ridership for each alternative, the model forecasted effects of each alternative on the highway network. For each commuter who would switch from driving to work, to taking the LIRR to work, there would be a reduction in "auto-mode trips" by one, and a reduction in "vehicle miles traveled" (VMT) by that person's round-trip commuting distance. Accordingly, the results of this forecasting are expressed in two forms: (1) as a change in vehicle trips in 2010 and 2020, and (2) as a change in VMT in 2010 and 2020. Overall, the Preferred Alternative would reduce total daily VMT by about 342,000 in 2010 and 375,000 in 2020.

Regional Trips

Total trips can be broken down into two subcategories: (1) trips made between home and work entirely via automobile, called "auto-mode trips," and (2) trips made between home and a local transit stop, called "drive-to-transit trips." While the Preferred Alternative would result in a net decrease in auto-mode trips (people who drive to work), it would also result in a net increase in drive-to-transit trips (people who drive to the train station). That is, fewer people would drive the entire distance to work and more people would drive to train stations to take the LIRR.

Another beneficiary of reduced VMT as a result of the Preferred Alternative would be Bronx County (-51,000 VMT in 2010 and -55,000 VMT in 2020). A worsening of already congested highway conditions in Queens for 2010 and 2020 is forecast to cause commuters to divert to Bronx roads in large numbers without the construction of the Preferred Alternative (the No Action Alternative). With the construction of the Preferred Alternative, these Bronx "through-trips" would be greatly reduced.

East River Crossings

The reduction in automobile commutes to work as a result of the Preferred Alternative (of approximately 11,000 in 2010 and 12,000 in 2020) would reduce the number of cars on East River bridge and tunnel crossings. Each day, the Triborough Bridge and the Queens-Midtown Tunnel would carry approximately 10,000 fewer cars into and out of Manhattan in 2010 (and almost 11,000 in 2020). While the Preferred Alternative would also remove cars from the Queensboro Bridge, it would not decrease the total number of cars on that bridge, as other cars (which formerly used the Triborough Bridge, Queens-Midtown Tunnel, or other East River crossings) would transfer to the toll-free Queensboro Bridge, filling it to capacity once again.

SUBWAY RIDERSHIP

By significantly changing commuting patterns both into Manhattan and within Manhattan, the Preferred Alternative would have an effect on subway ridership in addition to commuter rail ridership. The results of the ridership forecasting model indicated significant changes to subway ridership as a result of the Preferred Alternative in three general areas: on subways linking Queens and Manhattan; on subways to and from Penn Station; and on subways to and from GCT. Overall, the Preferred Alternative would reduce subway trips during peak hours.

Queens-Manhattan Subways

Weekday subway ridership from Queens into Manhattan in the AM peak period (6-10 AM) would decline by about 3 percent as a result of the Preferred Alternative (see Table 9B-5). The greatest reduction would occur on the No. 7 subway train into Manhattan, which would carry approximately 5,000 fewer passengers into Manhattan in the AM peak period.

Table 9B-5

AM Peak Period Ridership: Queens to Manhattan Subways, 2010, 2020

Subway*	2010		2020	
	No Action	Preferred	No Action	Preferred
N, R (at 60th Street)	67,260	67,273	70,652	70,368
E, F (at 53rd Street)	98,071	96,243	102,343	100,750
7 (at 42nd Street)	96,944	91,886	100,861	95,753
B, Q (at 63rd Street)	37,503	36,445	39,661	38,354
Total	299,778	291,847	313,517	305,226

Note: * Ridership measured as subway crosses East River into Manhattan.

- LOS A describes operations with very low delay, i.e., less than 5.0 seconds per vehicle. This occurs when signal progression is extremely favorable, and most vehicles arrive during the green phase. Most vehicles do not stop at all.
- LOS B describes operations with delay in the range of 5.1 to 15.0 seconds per vehicle. This generally occurs with good progression and/or short cycle lengths. Again, most vehicles do not stop at the intersection.
- LOS C describes operations with delay in the range of 15.1 to 25.0 seconds per vehicle. These higher delays may result from fair progression and/or longer cycle lengths. The number of vehicles stopping is significant at this level, although many still pass through the intersection without stopping.
- LOS D describes operations with delay in the range of 25.1 to 40.0 seconds per vehicle. At LOS D, the influence of congestion becomes more noticeable. Longer delays may result from some combination of unfavorable progression, long cycle lengths, or high volume-to-capacity (v/c) ratios. Many vehicles stop, and the proportion of vehicles not stopping declines.
- LOS E describes operations with delay in the range of 40.1 to 60.0 seconds per vehicle. This is considered to be the limit of acceptable delay. These high delay values generally indicate poor progression, long cycle lengths, and high v/c ratios.
- LOS F describes operations with delay in excess of 60.0 seconds per vehicle. This is considered to be unacceptable to most drivers. This condition often occurs with over saturation, i.e., when arrival flow rates exceed the capacity of the intersection. It may also occur at high v/c ratios with cycle failures. Poor progression and long cycle lengths may also be contributing to such delays.

According to generally accepted practice, LOS A, B, and C reflect the existence of delays within an acceptable-to-tolerable range, and LOS D and E suggest delays increasing into often unacceptable or breakdown conditions (LOS F, or LOS F* which indicates severe levels of congestion).

The analysis of existing traffic conditions in the GCT traffic study area was based on a blend of new counts conducted for this DEIS and counts conducted in the area for the Bear Stearns EIS, for its office development at 383 Madison Avenue. A total of 54 intersections were analyzed in detail, including 52 signalized intersections plus two unsignalized intersections along Vanderbilt Avenue. During the AM peak hour, 34 of the 54 intersections were operating at *overall* LOS A or B, 12 at LOS C, 7 at LOS D, 1 at LOS E, and none at LOS F (the "overall" conditions for an intersection represent a weighted average of all traffic movements at that intersection). Fourteen of the 54 intersections analyzed had at least one traffic movement at unacceptable LOS E or F. In general, for the *overall* intersection to be at LOS E or F, either one particular traffic movement needs to be operating at extremely congested conditions or two or more traffic movements need to be at LOS E or F.

In the midday peak hour, 31 of the 54 intersections were operating at LOS A or B, 20 at LOS C, 1 at LOS D, 2 at LOS E, and none at LOS F. Twelve of the 54 intersections had at least one traffic movement at unacceptable LOS E or F.

In the PM peak hour, 37 of the 54 intersections were at overall LOS A or B, 15 were at LOS C, 2 at LOS D, and none at LOS E or F. Eight of the 54 intersections were characterized by at least one traffic movement at unacceptable LOS E or F.

Table 9B-7
LIRR Passengers Transferring to Subways at Grand Central Terminal: 6-10 AM Peak Period, 2010, 2020

	2010		2020	
	No Action	Preferred	No Action	Preferred
4/5 Southbound	0	4,223	0	4,485
6 Southbound	0	810	0	842
4/5 Northbound	0	683	0	583
6 Northbound	0	1,634	0	1,646
7 Eastbound	0	4	0	4
7 Westbound	0	21	0	23
Shuttle	0	0	0	0
Total Transfer to Subway	0	7,375	0	7,583

- A reduction in AM peak period passengers on the No. 7 subway line into Manhattan of more than 5,000 in 2010 and 2020. This subway line currently operates at capacity.
- A reduction in AM peak period passengers on Penn Station-area subway lines of almost 18,000 in 2010 and more than 18,000 in 2020.

Local Impacts of the Preferred Alternative

The Preferred Alternative also results in some impacts to local transportation systems in Manhattan and on Long Island. These include:

- An increase in the number of pedestrians and taxis in the GCT area during peak hours.
- An increase in the number of passengers boarding the Lexington Avenue subway lines in the peak hour. The biggest impact would be on the southbound 4/5 trains, which would receive approximately 4,200 more peak period riders in 2010 and 4,500 in 2020.
- Increased traffic and parking demand at LIRR stations on Long Island.

All three of these issues are addressed in depth later in this chapter.

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C. GRAND CENTRAL TERMINAL (GCT) AREA

The area surrounding GCT is the focus of intensive concentrations of activity by all modes of transportation. The GCT area, therefore, was analyzed in detail for all modes—traffic and parking, pedestrian flows inside and outside of the terminal itself, commuter rail passenger flows, subway issues, and bus transportation—since any or all of them could potentially be impacted by the East Side Access Project. Overall, the Preferred Alternative would provide additional capacity and flexibility for commuters from eastern Queens and Long Island to travel to work by public transportation rather than by auto. It would produce a series of benefits and impacts due to the transferral of much commuter activity to the GCT area from the Penn Station area, which are assessed in detail in this section of the DEIS.

EXISTING CONDITIONS

TRAFFIC

The GCT traffic study area encompasses the area bounded by and including 48th Street to the north, 40th Street to the south, Third Avenue to the east, and Fifth Avenue to the west, and other intersections along 42nd Street extending west to Times Square and east to First Avenue. It is within this area that the vast majority of new traffic generated by the project can be anticipated, primarily by taxis picking up or dropping off LIRR commuters in the immediate vicinity of GCT. This traffic study area is shown in Figure 9C-1; it encompasses 54 intersections overall.

Traffic volumes in the GCT area are generally constant throughout a typical business weekday. Examination of traffic volumes entering a cordon around the traffic study area indicates that AM, midday, and PM peak hour volumes overall are generally within 5 percent of each other. Crosstown volumes along 42nd Street are generally 700 to 900 vehicles per hour (vph) right in front of GCT at Park Avenue, while other east-west crosstown street volumes are generally in the 400 to 700 vph range for streets that "go through" the entire area (other streets that are discontinuous, i.e., don't "go through" the entire area because they are blocked by GCT, have volumes that are generally in the 150 to 450 vph range).

North-south avenue volumes are higher, but are also fairly consistent during the AM, midday, and PM peak hours. Traffic volumes along Fifth, Madison, Lexington, and Park Avenues (each direction along Park Avenue) are generally in the 1,200 to 1,800 vph range. Traffic volumes are higher on Third and Second Avenues, reflecting their function more as through traffic carriers; they generally carry about 2,200 to 2,700 vph, with Second Avenue carrying 3,000 to 3,800 vph in the AM peak hour, since it is a major southbound route for traffic that enters Manhattan via the Queensborough Bridge at 59th Street and Second Avenue.

The analysis of traffic conditions followed *1994 Highway Capacity Manual (HCM)* procedures. According to the *HCM*, the capacities of intersections are based on geometric conditions (number of lanes, lane widths, etc.), traffic conditions (volumes, vehicle classifications, pedestrians, etc.), and signalization conditions (cycle lengths, phasing, and green time allocations).

Based on the intersection capacity analyses, levels of service (LOSs) are established defined in terms of average vehicle delay, with the conditions that the driver is likely to encounter at each LOS as follows for signalized intersections:

Table 9C-1
Existing Traffic Level of Service Summaries: Grand Central Terminal Study Area

Intersection	AM Peak Hour		Midday Peak Hour		PM Peak Hour	
	LOS	Critical Movements with LOS E or F	LOS	Critical Movements with LOS E or F	LOS	Critical Movements with LOS E or F
Seventh Ave. and 42nd St.	D	—	B	—	B	—
Broadway and 42nd St.	C	42nd St. WB lefts (LOS F) and throughs (LOS E)	C	—	C	42nd St. WB (LOS E)
Sixth Ave. and 42nd St.	D	42nd St. WB rights (LOS F)	C	42nd St. WB rights (LOS F)	C	42nd St. WB rights (LOS F)
Fifth Ave. and 48th St.	B	—	B	—	B	—
Fifth Ave. and 47th St.	B	—	B	—	B	—
Fifth Ave. and 46th St.	B	—	B	—	B	—
Fifth Ave. and 45th St.	B	—	C	45th St. WB (LOS E)	B	—
Fifth Ave. and 44th St.	B	—	B	—	B	—
Fifth Ave. and 43rd St.	B	—	C	43rd St. WB (LOS E)	B	—
Fifth Ave. and 42nd St.	C	—	C	—	C	—
Fifth Ave. and 41st St.	B	—	B	—	B	—
Fifth Ave. and 40th St.	B	—	B	—	B	—
Madison Ave. and 40th St.	B	—	C	—	B	—
Madison Ave. and 41st St.	B	—	C	—	B	—
Madison Ave. and 42nd St.	D	42nd St. EB (LOS E)	D	42nd St. EB (LOS E)	C	—
Madison Ave. and 43rd St.	B	—	B	—	B	—
Madison Ave. and 44th St.	B	—	B	—	B	—
Madison Ave. and 45th St.	B	—	C	—	B	—
Madison Ave. and 46th St.	B	—	C	—	B	—
Madison Ave. and 47th St.	B	—	B	—	B	—
Madison Ave. and 48th St.	B	—	B	—	B	—
Vanderbilt Ave. and 47th St.	C	—	B	—	B	—
Vanderbilt Ave. and 46th St.	B	—	B	—	B	—
Vanderbilt Ave. and 45th St.	C	—	B	—	C	—
Vanderbilt Ave. and 44th St.*	A-B	—	A-B	—	A-B	—
Vanderbilt Ave. and 43rd St.*	A-B	—	A-B	—	A-B	—
Vanderbilt Ave. and 42nd St.	C	—	C	—	C	—
Park Ave. and 40th St.	B	—	B	—	C	40th St. EB (LOS E)
Park Ave. SB and 41st St.	B	—	B	—	C	—
Park Ave. NB and 41st St.	B	—	B	—	B	—
Park Ave. and 42nd St.	D	Park Ave. NB rights and 42nd St. EB (LOS E)	C	Park Ave NB rights (LOS F)	C	42nd St. EB rights (LOS F)
Park Ave. and 46th St.	C	Park Ave. SB lefts (LOS F)	C	Park Ave. SB lefts (LOS F)	C	—
Park Ave. and 47th St.	B	—	B	Park Ave. NB lefts (LOS F)	B	—
Park Ave. and 48th St.	C	Park Ave. SB lefts (LOS F)	B	—	B	—
Lexington Ave. and 48th St.	B	—	B	—	B	—
Lexington Ave. and 47th St.	C	—	C	—	B	—
Lexington Ave. and 46th St.	B	—	C	—	B	—
Lexington Ave. and 45th St.	D	Lexington Ave. SB (LOS E)	E	Lexington Ave. SB (LOS E)	C	—
Lexington Ave. and 44th St.	C	—	E	Lexington Ave. (LOS E)	D	—
Lexington Ave. and 43rd St.	C	—	B	—	C	—
Lexington Ave. and 42nd St.	E	Lexington Ave. SB and 42nd St. EB (LOS E)	C	—	C	—
Lexington Ave. and 41st St.	C	—	B	—	B	—

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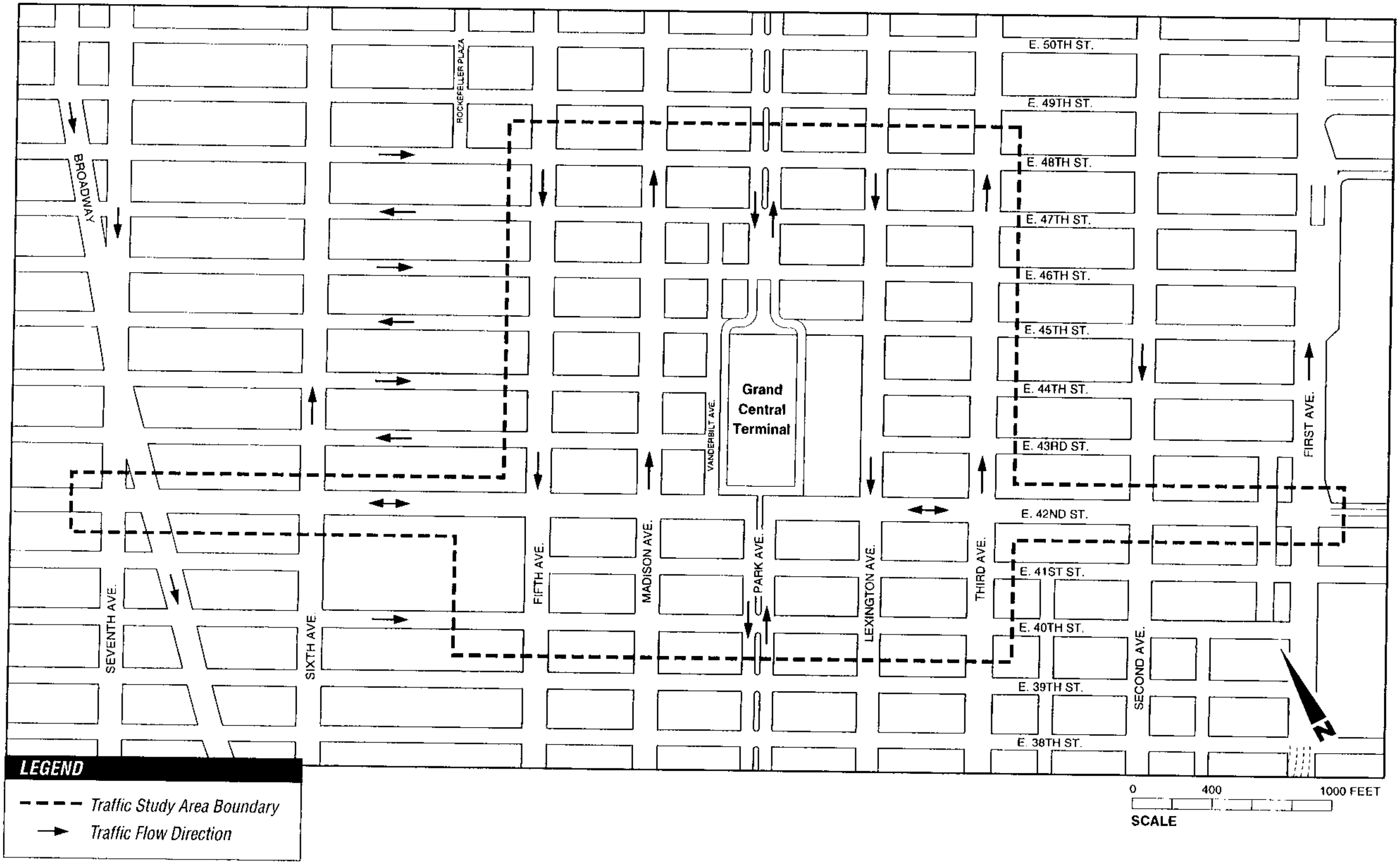

MTA / LIRR
East Side Access

Figure 9C-1

Traffic Study Area in Manhattan

morning peak period and approximately 45,000 during the peak AM hour. During the AM peak hour, 50 trains are scheduled to arrive at GCT, with a total of 373 cars. While the average train is seven cars long, train length varies from a few as 4 cars to as many as 12.

MNR operations include three train lines—serving commuters from the Bronx, Westchester, Putnam, and Duchess Counties in New York, as well as Fairfield and New Haven Counties in Connecticut—all of which terminate in GCT. Of these three lines, the New Haven Line carries about 43 percent of MNR commuters, the Harlem Line about 35 percent, and the Hudson Line 22 percent.

South of 96th Street, trains from all three MNR lines all run via tracks under Park Avenue, into and out of the upper and lower levels of GCT. GCT itself contains a total of 44 tracks that can be used for passenger trains—29 on its upper level and 15 on its lower level. In addition to these "platform" tracks, GCT also contains 49 yard tracks, currently used by Metro-North for storage and routine maintenance of trains.

Because Metro-North runs more scheduled trains in peak periods than in off-peak periods, trains that arrive in the morning peak period need to be stored during midday, awaiting use for commuters leaving during the evening peak period. In addition to storing approximately 31 trainsets on storage tracks within GCT, Metro-North uses a large portion of its main platform tracks to store approximately 34 trainsets in the midday. An additional 14 trainsets are stored at remote suburban yards (Croton-Harmon, North White Plains, or Stamford) for lay-up in the midday; these trains return to GCT to carry passengers in the peak PM period.

Some of the track elements constructed for GCT when it opened in 1913 have since been removed to streamline MNR's operations at GCT. The eliminated features include a circular "loop" track on the lower level, several yard tracks, numerous switch turnouts and crossovers, and segments of "ladder" lead tracks that provided alternate routes for trains to switch between tracks. Although it is no longer used, the lower level loop track still exists beneath GCT. Additionally, certain existing yard tracks have been stub-ended, preventing through movement and requiring access from one end only. Three former platform tracks (the former upper level tracks 22 and 31 and former track 113 on the lower level) have had their track/platform expanse converted into support facilities for train servicing activities (i.e., yard supervision offices, employee locker/lunch rooms, technical backshops, and tool and parts component storehouses).

Operations North of GCT. MNR operations depart GCT to the north on a four-track main line that initially operates under Park Avenue before rising to a viaduct over Park Avenue at 96th Street. Five miles north of GCT, the Hudson Line separates from the combined Harlem and New Haven Lines at Mott Haven Junction in the South Bronx. Those two routes then break away from one another 6.5 miles farther north at Woodlawn Junction.

With three heavily traveled routes operating on the four-track Park Avenue main line feeding GCT, peak-period operations on MNR face potential congestion. To accommodate the heavy volume of trains during the 90 busiest minutes of the peak AM and PM periods, MNR operates the four-track main line with three tracks in the peak direction and one for reverse peak operations.

Amtrak and NJ Transit

As described in Chapter 2, the Preferred Alternative's route into GCT would take LIRR trains along tracks at Harold Interlocking in Queens, currently used by both Amtrak and NJ Transit. Both NJ Transit and Amtrak currently store and maintain trains in Sunnyside Yard, and must use

Most of the individual traffic movements currently operating at LOS E or F conditions generally occur along the 42nd Street corridor or on other east-west crosstown streets approaching the major north-south avenues. A summary of the intersection LOS findings is presented in Table 9C-1 below; details of the analyses are provided in the Technical Appendix.

PARKING

The East Side Access Project is not expected to generate any automobile parking demands at GCT because it is unlikely that people would drive to GCT, park in the area, and then take LIRR service to Queens or Long Island. It would, however, generate additional taxi usage and, thereby, additional utilization of curb space. It is the availability of curb space at GCT and other taxi stand locations near GCT that is the focus of this section.

In general, daily or hourly parking on the avenues or cross-streets throughout the GCT study area is prohibited. The predominant on-street parking regulation is "No Standing Anytime between 7 AM and 7 PM Except for Loading and Unloading." Along Fifth, Madison, Lexington, and Third Avenues, parking or standing along one side of the avenue is prohibited, since these curbs are used for bus stops or the curb lane is an active bus lane. At some locations, the regulations are "No Standing Anytime" (for example, along the east side of Fifth Avenue between 42nd and 48th Streets), and in other locations, the curb is reserved for taxi stands (e.g., east side of Lexington Avenue between 42nd and 44th Streets and the north side of 42nd Street between Park and Vanderbilt Avenues).

During the AM and midday peak periods, two parking conditions prevail. Blockfaces that allow standing for loading and unloading are usually filled with commercial delivery vehicles, while those curbs where parking or standing are prohibited are usually free of any vehicles. Some streets have double-parked delivery vehicles, including 43rd and 44th Streets west of GCT, 45th Street between Vanderbilt and Lexington Avenues, and 40th Street between Madison and Lexington Avenues. During the PM peak period, the parking occupancies along the left (or, non-bus) curb faces on the avenues drop to about 60 percent while legal loading and unloading spaces along the cross streets remain close to 100 percent occupied.

Parking regulations and usage around the GCT superblock vary according to each side. On Vanderbilt Avenue, "No Standing Anytime" regulations are posted along the west side of GCT yet most of the curb spaces are occupied by delivery vehicles or personal autos with official permits in the windshield. On the south curb of 45th Street, near Vanderbilt Avenue, where the parking regulations prohibit standing except for deliveries, many vehicles are usually double parked. Between the Helmsley Walks, the regulation changes to "No Stopping Anytime," yet delivery vehicles can be found parked there as well. Approaching Lexington Avenue, the south curb is occupied by postal vehicles where the regulations allow for only these vehicles. On Lexington Avenue, the west curb adjacent to GCT is reserved for bus stops and taxi drop-offs, and is generally free of any parked or standing vehicles. South of GCT on 42nd Street, the north curb in front of the Grand Hyatt Hotel is usually very active with taxi and charter bus drop-offs and pick-ups. Just west of the hotel, at GCT's "front door," the curb is typically clear, since it is a bus stop, and between Park and Vanderbilt Avenues, as a taxi stand.

There are posted taxi stands along the south and west blockfaces of the terminal near the Vanderbilt Avenue/42nd Street intersection and on the east side of Lexington Avenue across from GCT. The Grand Central Partnership employs taxi control agents at each location during the 7-11 AM and 3-11 PM periods to manage the flow of cabs and keep the taxi queuing locations

For the new LIRR platforms within GCT, two sets of platform analyses were conducted, since Platforms 4 and 5 have a different configuration from Platforms 1, 2, and 3. All GCN vertical circulation elements to the street and the crosspassages were examined.

Typically, pedestrian volumes are directionally peaked out of GCT in the morning as commuters are traveling to work, while the reverse is true in the late afternoon periods. AM peak pedestrian conditions in the lower concourse experience only limited congestion, helped in part by single train arrivals spread across all tracks. The lower concourse area is not subject to the daily high cross-flow conflicts of multiple train unloadings that are common in the upper concourse. However, with the recent openings of new restaurants and seating areas in the lower concourse, there has been a significant reduction in free circulation, though no undue congestion has been noted.

The focus of the analysis is on identifying those circulation patterns that would closely mirror future LIRR patterns from the westernmost tracks in the lower concourse, and observing the current usage of those elements. This will allow determination of existing LOSs, assignment of LIRR passengers through the area, and impact determination.

The busiest pedestrian element in the lower concourse is the Vanderbilt Avenue north stair, with about 1,700 people traveling up along it in the AM peak hour and another 1,700 people using it to descend in the PM peak hour. The new escalator leading up facing the NYCT Museum Store processes about 1,550 people in the AM peak hour, while 1,400 people descend this element in the PM peak hour. About 1,600 people use the Oyster Bar ramp heading east toward the IRT subway stairwell and 1,450 people travel down this ramp in the PM peak hour.

In the upper concourse, 12,000 people move up the Met Life building escalators in the AM peak hour, while 10,200 people use this element to enter GCT in the PM peak hour. The Roosevelt Passageway is used by between 5,000 and 4,200 people in the respective AM (outbound) and PM (inbound) peak hours. Stairs from the incoming train room, now referred to as the Biltmore Room, are used by 2,250 people leaving the terminal during the morning peak hour, while 1,700 people descend this stairwell in the PM peak hour. About 4,500 people (AM) use the Graybar Passageway to exit GCT toward Lexington Avenue, and 4,200 people (PM) to enter the terminal. The Hyatt Passageway carries a variety of flows and depending on location along it, are either balanced in both directions near the large Hudson News store (5,000-6,000 people in AM and PM peak hours) or unidirectional closer to Lexington Avenue (3,400 people out in the AM, 4,400 people in during the PM) due to the presence of the Lexington Avenue subway. About 3,250 people enter and exit from the main "front door" to 42nd Street past the main waiting room (Vanderbilt Hall) in the AM peak hour, while about 4,000 people use this access in the PM peak hour. The passageway leading to the shuttle is used by 2,450 (AM peak hour) to 2,850 (PM peak hour) people as they exit the terminal, while this same corridor is used by 1,900 people (AM and PM) to enter GCT. The parallel ramp leading up to the Vanderbilt/42nd corner carries 2,300 people in the AM and 3,050 in the PM peak hours.

The two stair/escalator elements leading to the IRT subway station are among the most heavily used in the entire terminal (see Figure 9C-2). Although these elements are used by many pedestrians originating from many directions and have limited available capacity, they will likely be used by those LIRR riders traveling to destinations far south of the terminal. The stair/escalator bank serving the south end of the subway platform is the busier of the terminal's two IRT vertical circulation banks, with about 11,000 people using this element to travel into and out of GCT during both the AM and PM peak hours. Of these flows, the down movements are heavier,

Table 9C-1 (continued)
Existing Traffic Level of Service Summaries: Grand Central Terminal Study Area

Intersection	AM Peak Hour		Midday Peak Hour		PM Peak Hour	
	LOS	Critical Movements with LOS E or F	LOS	Critical Movements with LOS E or F	LOS	Critical Movements with LOS E or F
Lexington Ave. and 40th St.	B	—	B	—	B	—
Third Ave. and 40th St.	B	—	B	—	B	—
Third Ave. and 41st St.	B	—	B	—	B	—
Third Ave. and 42nd St.	D	42nd St. WB rights (LOS F)	C	Third Ave. rights and 42nd St. WB rights (LOS E)	C	42nd St. WB rights (LOS F)
Third Ave. and 43rd St.	B	43rd St. WB (LOS F)	B	—	B	43rd St. WB (LOS E)
Third Ave. and 44th St.	B	—	B	—	B	—
Third Ave. and 45th St.	B	—	B	—	B	—
Third Ave. and 46th St.	B	46th St. EB (LOS E)	B	—	B	—
Third Ave. and 47th St.	B	—	C	47th St. WB (LOS E)	B	47th St. WB (LOS F)
Third Ave. and 48th St.	B	48th St. EB (LOS F)	C	48th St. WB (LOS E)	B	—
Second Ave. and 42nd St.	C	42nd St. WB (LOS E)	C	—	C	—
First Ave. and 42nd St.	D	42nd St. EB lefts (LOS F) and 42nd St. WB rights (LOS E)	C	—	D	42nd St. EB lefts and 42nd St. WB rights (LOS E)

Note: * indicates unsignalized intersection.

clear of other vehicles. Field observations indicate the Vanderbilt Avenue stand is more "popular" for commuters (between 10 and 30 people wait in queue at any time during the AM peak) as it appears to process the highest taxicab throughput. Even when 20 individuals are on line for a taxi, the volume of taxicabs entering is such that an individual usually waits for only a few minutes for a taxi. In addition, it is protected from the weather and has a slightly better interface with the terminal than any other nearby taxi stand. The 42nd Street taxi stand is used by fewer people, with 10 to 15 people noted in queue at any time during the morning hours. Although the taxi stand is situated on a main crosstown street, people generally have to wait much longer for a taxi as the volume of taxicabs at this location is much less than that at the Vanderbilt Avenue stand. One possible reason for this is that an empty taxi, heading west on 42nd Street past the main terminal street access and the Grand Hyatt hotel, will likely be hailed before arriving at this taxi stand.

COMMUTER RAIL

Metro-North Railroad

Currently, one commuter railroad serves GCT—MTA Metro-North Railroad (MNR). Metro-North is the second-largest commuter rail system in the United States, providing more than 200,000 customer trips each weekday and some 62 million trips per year. The service currently provided by MNR began with the New York & Harlem Railroad, which introduced a horse-car line in Lower Manhattan in 1832. MNR currently has a fleet of more than 800 cars and engines, 339 route miles, and 738 miles of track.

Operations at GCT. Grand Central Terminal is MNR's primary destination for commuters each morning—four out of every five trips on MNR end at GCT during the AM peak period (6 AM to 10 AM). This translates to more than 75,000 passengers arriving at GCT during the

Harold Interlocking to get trains from the East River tunnels to the yard. Additionally, Amtrak uses Harold Interlocking as its main route for Northeast Corridor service to and from Boston, as trains travel through Harold Interlocking and onto tracks that lead over the Hell Gate Bridge towards Boston. Currently, two Amtrak Northeast Corridor trains use Harold Interlocking.

PEDESTRIAN CONDITIONS WITHIN GCT

The analysis of potential impacts within GCT focused on key representative corridors, passageways, and stairwells that could be affected by introduction of LIRR service into GCT. LIRR service would utilize tracks that lie under the terminal's west edge on the lower concourse, and result in new pedestrian flows within the terminal. These affected areas would include the track platforms and its stairwells to the lower and upper concourse levels of GCT, to concourse and passageway elements designed for the LIRR and for Metro-North Railroad (MNR) riders under the Grand Central North (GCN) project, to subway connections within GCT, and to the streets and sidewalks bordering GCT and farther away from the terminal.

Within the LIRR East Side Access Feasibility Study* that preceded this DEIS, the ability of GCT track platforms, stairwells connecting the platforms with the newly designed LIRR and GCN passageways, and the new passageways themselves to accommodate maximum anticipated ridership levels were analyzed in detail, with regard to both typical LOSs and their ability to satisfy NFPA 130** emergency egress requirements. That study showed that acceptable standards could be achieved in a 10-exit scheme. For this DEIS, analyses for potentially affected pedestrian elements included the following (see Figure 9C-2):

- The four main separate stairwell and escalator banks connecting the lower and upper concourses;
- The east and west stairwell/escalator elements connecting the terminal to the IRT 4/5/6 subway;
- The Graybar, Lexington (Hyatt), Roosevelt and new 43rd Street passageways;
- The 42nd Street shuttle passage in GCT;
- The "free" passageway between the 42nd Street shuttle and IRT 4/5/6 mezzanine;
- The east ramp leading up from the Oyster Bar and lower concourse;
- The Vanderbilt Avenue staircase in the upper concourse;
- The escalator bank leading up to the Metropolitan Life building;
- The stairbank leading to 43rd Street from the Biltmore Room;
- The IRT 42nd Street 4, 5, 6 subway stairs and platforms and the station's western fare control area (FCA); and
- All doorways between the terminal itself and the exterior sidewalks.

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* *Operational and Physical Feasibility Study of Long Island Rail Road Access to Manhattan's East Side* (April 1993).

** National Fire Protection Association 130, the "*Standard for Fixed Guideway Transit Systems*" (1997).

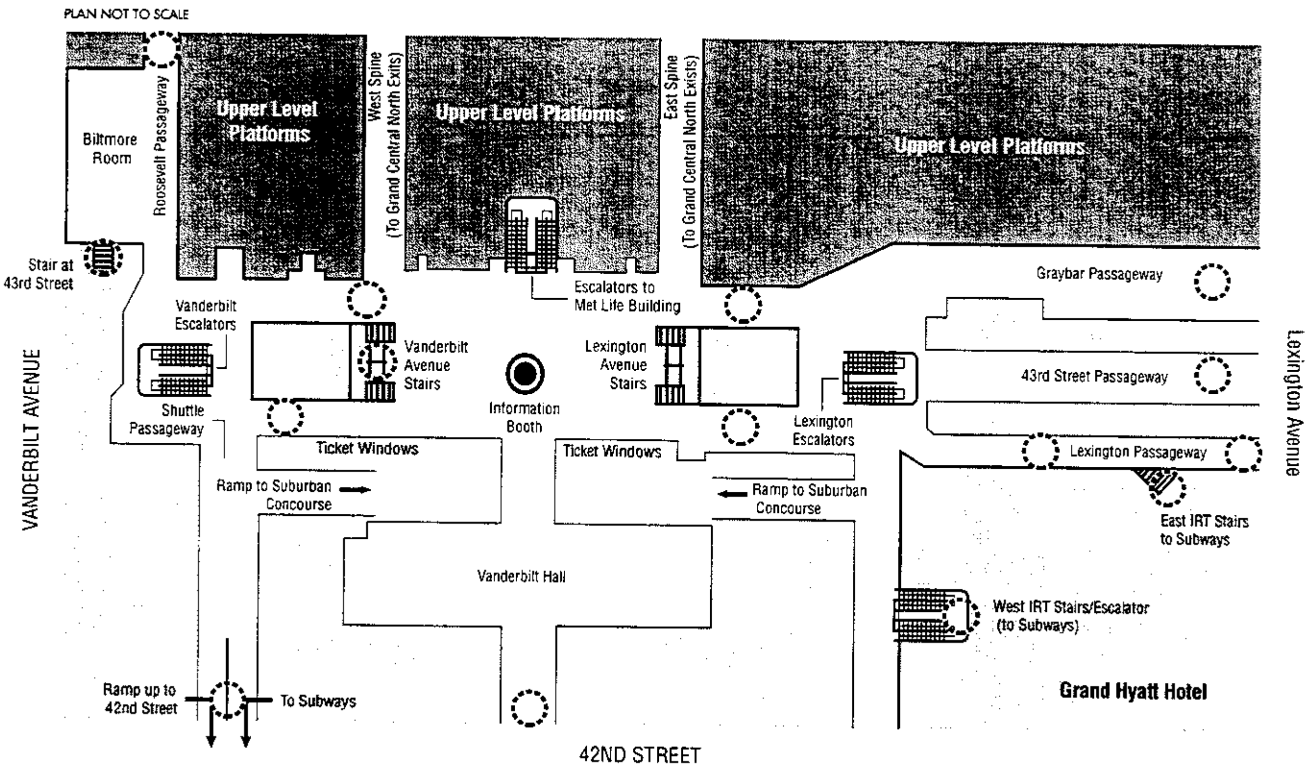
Depending on the type of pedestrian element examined, different processing rates prevail. Specifically, stairways process, or move, fewer pedestrians than do corridors and passageways, since vertical movement is involved. At LOS A, stairs process at a rate of 5 persons per foot per minute (PFM), while 7 PFM is the rate for corridors. At LOS B, stair rates lie within a 5-7 PFM range, while corridors operate within a 7-10 PFM range. At LOS C, stairs operate in a 7-10 PFM range, while corridors operate in the 10-15 PFM range. At LOS D, stairs move pedestrians in the 10-13 PFM range, while for corridors, people are processed at a 15-20 PFM rate. At theoretical capacity LOS E, stairs operate in the 13-17 PFM range, while corridors are within the 20-25 PFM range. When LOS F conditions prevail, stairs process people at a rate of 17 PFM or more, while corridors operate at a 25 or more PFM rate.

Escalators, on the other hand, process pedestrians at fixed rates, since their operating speeds are constant. Most escalators in GCT operate at a speed of 90 feet per minute and have a width for two people abreast. For 48-inch-wide (double lane) escalators moving at 90 feet per minute along their incline, about 100 persons per minute can be processed. This is a nominal, not theoretical, maximum, since "skipped" treads (or three people on two treads that could fit four) are accounted for. Yet another observed adjustment involves skipped lanes, as people pause momentarily before stepping onto a moving tread to allow extra "body circulation area" to develop with the person ahead. Accounting for this, a processing rate of 75 persons per minute was observed.

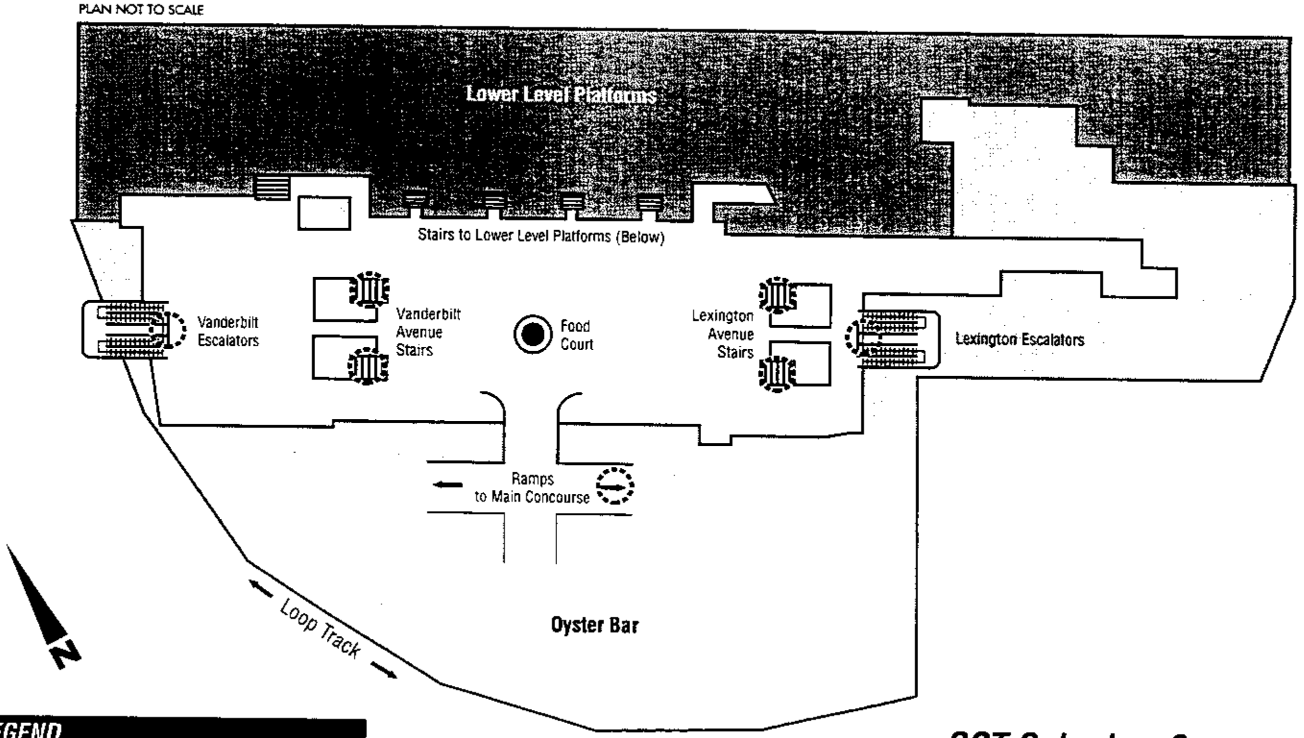
According to generally accepted practice, LOS A, B, and C indicate acceptable conditions, LOS D and E characterize the beginning of significant congestion, and LOS F represents unacceptable conditions. NYCT considers LOS C/D to be a preferred design standard for their station elements, although this is less than the theoretical capacity attained at LOS E threshold. For pedestrian flow analyses, 15-minute peak periods are the periods typically analyzed, although counts are often conducted in 5-minute peak increments for rail terminals. Both 5- and 15-minute peak periods were analyzed in this DEIS.

In terms of operations in GCT itself, with one exception, no vertical circulation element on the lower concourse experiences significant congestion during the AM and PM peak periods, and conditions are characterized by LOS C/D or better throughout both periods. The sole point of some congestion (LOS D) is the new escalator that rises to face the NYCT Museum Store on the upper concourse. This element has two escalators, but because only one moves upward in the AM peak, there is limited capacity to process high passenger demands, particularly when trains arrive at nearby Tracks 111-116 that lie to the lower concourse's west side. For all other cases, passenger demands are lower than processing rates of the stairs and escalators being used. These acceptable conditions are helped in part by the introduction of new vertical circulation elements between the lower and upper concourses in GCT's revitalization efforts. Also, the scattered train arrival and departure schedules on the lower concourse tend to disperse pedestrians to different exit points.

Tables 9C-2 and 9C-3 present pedestrian flow conditions through selected circulation elements on the upper concourse level for the peak 5- and 15-minute periods within the respective AM and PM peak hours. The upper concourse operates acceptably with a few exceptions. The Met Life escalators operate at or over capacity but only in the 5-minute peak period upward in the AM; over the course of the more conventional 15-minute analysis period, capacity is not an issue. The stair/escalator bank leading to the west IRT 4/5/6 mezzanine operates at LOS E/F during each peak period, indicating overcrowding and queuing at the stairs' landing areas. All doorway elements leading to outside sidewalks operate at LOS C/D or better (see Table 9C-4).



GCT Main Concourse



GCT Suburban Concourse

LEGEND

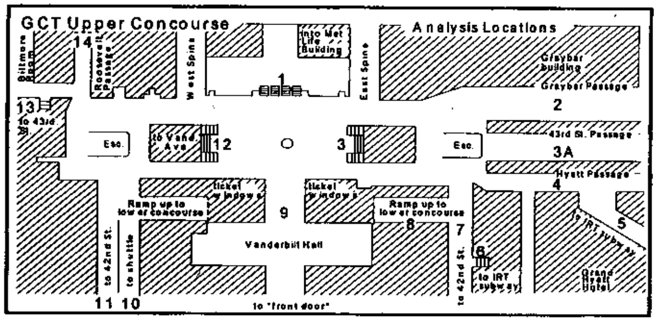
- ▨ *Track and Platform Areas*
- ☐ *Retail and Other Areas*
- ◌ *Pedestrian Analysis Location*

Figure 9C-2

Pedestrian Analysis Locations: Grand Central Terminal

Table 9C-3
EXISTING PM PEAK PERIOD ANALYSIS OF PEDESTRIAN CIRCULATION ELEMENTS WITHIN GRAND CENTRAL TERMINAL

Pedestrian Element		*Peak 5 Minutes within Peak PM 15-Minute Period*		*Peak PM 15-Minute Period*	
Location	**Section**	**Pedestrian Volume**	**LOS**	**Pedestrian Volume**	**LOS**
1. Met Life Building Escalators	1 Up Escalator	180	under capacity	480	under capacity
	3 Down Escalators	920	under capacity	2,700	under capacity
2. Graybar Passageway	Corridor	535	B	1,460	B
3. Lexington Ave. Stairs / Escalators	North Stairs from Lower Concourse	100	A	245	A
	South Stairs from Lower Concourse	40	A	110	A
	Up Esc. Facing Hudson News	5	under capacity	15	under capacity
	Down Esc. Facing Hudson News	60	under capacity	150	under capacity
	North Corridor	695	A	1,825	A
	South Corridor	890	B	2,530	B
4. Hyatt Passageway	Corridor	495	B	1,385	B
5. Eastern IRT Subway Stairs	Stairs	640	C	1,600	C
6. Western IRT Subway Stairs / Escalators	Stairs	560	F	1,375	E
	Up Escalator	235	under capacity	635	under capacity
	Down Escalator	295	under capacity	860	under capacity
7. East Passageway to 42nd St. (Park-Lex)	Corridor	1,050	B	2,685	B
8. Lower Concourse East Ramp	Ramp	180	A	440	A
9. 42nd St. Main Entrance	Corridor	385	A	1,050	A
10. Shuttle Passageway	Corridor	515	A	1,265	A
11. Ramp to Vanderbilt Ave. / 42nd St. Corner	Ramp	355	B	990	B
12. Vanderbilt Ave. Stairs / Escalators	North Stairs from Lower Concourse	205	B	480	B
	South Stairs from Lower Concourse	15	A	45	A
	Up Esc. Facing NYCT Store	5	under capacity	15	under capacity
	Down Esc. Facing NYCT Store	160	under capacity	370	under capacity
	North Corridor	800	B	1,700	A
	South Corridor	565	A	1,460	A
13. 43rd St. Stairs in Biltmore Room	Stairs	180	B	500	B
14. Roosevelt Passageway	Corridor	400	C	1,145	C



with between 6,000 and 7,000 people descending toward the subway. The stairwell closer to Lexington Avenue is about half as busy (although there are other external stairwells serving the IRT's north platform end), with between 3,000 and 3,200 pedestrians moving both up and down between the Hyatt Passageway and the subway (through NYCT FCA No. 240) during peak hours.

The *HCM* was used as the procedural basis for all pedestrian LOS analyses on stairwells, within corridors and passageways, for sidewalks and crosswalks, and for vehicular LOSs. The time-space analysis procedures (source: *Pedestrian Time-Space Concept: A New Approach to the Planning and Design of Pedestrian Facilities*), which allow for analysis of assembly areas, were used to assess all platform and crosspassage areas.

Pedestrian service standards are based on the freedom to select normal walk speed, the ability to bypass slow-moving pedestrians, the relative ease of cross- and reverse-flow movements at various pedestrian traffic concentrations, and in the case of waiting pedestrians, queuing or standing space availability. The LOS standards range from "A" (best) to "F" (worst). These standards are primarily based on the space needs of people involved in various activities, and are widely used today for planning and design of facilities for pedestrians. Brief descriptions of each LOS standard for stairs and walkways follow.

- LOS A (20 or more square feet per pedestrian [sfp] on stairs; 40 sfp on walkways), there is sufficient area provided to freely select stair walk speed, to bypass slow pedestrians, and to easily permit reverse flows. A volume-to-capacity, or v/c, ratio of 0.45 or better characterizes this LOS.
- LOS B (15-20 sfp on stairs; 24-40 sfp on walkways) sees virtually all persons freely selecting their stair walking speeds, but some difficulties would be experienced passing slower pedestrians. Also, reverse flows present no serious conflicts. V/C ratios in the 0.45-0.70 range characterize this LOS.
- Within LOS C (10-15 sfp on stairs; 16-24 sfp on walkways), stair walking speeds are slightly restricted due to the inability to pass slower pedestrians, and no serious conflicts with reverse flows are apparent. V/C ratios in the 0.70-1.00 range characterize this LOS.
- At LOS D (7-10 sfp on stairs; 11-16 sfp on walkways), the initial range begins where some circulation ability is restricted, with some friction between pedestrians becoming noticeable. Stair walking speeds are restricted for the majority of persons due to the inability to pass slower pedestrians, and reverse flows encounter some conflicts. V/C ratios in the 1.00-1.33 range characterize this LOS.
- At LOS E (4-7 sfp on stairs; 6-11 sfp on walkways), the theoretical capacity of the stairwell is reached, where normal stair walking speeds are reduced because of minimum tread space and an inability to bypass others. Also, intermittent stoppages may occur, reverse flows experience serious conflicts, and "shuffling" is common. Levels E and D are typically experienced for short-term periods when, for example, train arrivals into a terminal unload a large body of riders at once. V/C ratios in the 1.33-1.67 range characterize this LOS.
- In LOS F (4 or less sfp on stairs; 6 sfp or less on walkways), unavoidable contact occurs between passing pedestrians, and most pedestrians are queued rather than actively moving. A complete breakdown in pedestrian flow is experienced, with many stoppages occurring. V/C ratios greater than 1.67 signify LOS F conditions.

where an existing pedestrian area is being analyzed and the calculated v/c ratios are less than 1.00, pedestrian operations are actually LOS C/D or better. In the event that the calculated LOSs exceed these standards and v/c ratios exceed 1.00, the actual pedestrian flow conditions are worse than LOS C/D. Then, lower LOS standards (i.e., LOS D or worse thresholds) are used to recompute pedestrian conditions. When computed v/c ratios drop below a capacity condition (v/c = 1.00), the actual LOS is identified.

For the Lexington Avenue subway at 42nd Street, all platforms and stairs and conditions in the main fare control area leading down to the subway from GCT (FCA No. 238*) were analyzed (see Figure 9C-3). Generally, the turnstile bank leading to the southernmost subway platform areas is the most heavily used, since it is closest to the core of the terminal above. In the future with LIRR passengers using this station, a determination of their likely travel path into the station and down to the platform was done. To assign these new subway riders to the station, pedestrians were traced into the mezzanine area (one level above the platforms) as they passed through the turnstile area.

From the western mezzanine near FCA No. 238, there are three and four stairwells serving the respective south- and northbound platforms. Sample counts indicated that about 50 percent of all people entering the subway in this area use the stairwell (P14) directly in front of the turnstiles when traveling downtown. Uptown stairwells are used in a more even manner with about 30-35 percent of the FCA No. 238 pedestrian traffic using the three nearest elements (P15, 17, 19). In both cases, this is consistent with observations in GCT that mass transit commuters appear to want to move vertically first and then, in the case of the subways, horizontally along the platform so they could board a subway train if it arrives while they are walking.

For the eastern mezzanine at FCA No. 240 leading to the subway from the Grand Hyatt and the Chrysler Building, where two stairwells can be accessed to descend to the south- and northbound platforms, there is another utilization imbalance. For downtown service, the stair facing the turnstiles (P20) is used by about two-thirds of all southbound riders, while when traveling uptown, the stairwell directly (P23) adjacent to the turnstile line is used by a similar disproportion.

Two platform zones are close to the threshold of LOS C/D conditions when examining a 5- or 15-minute peak period, namely, the platform zones reached at the bottom of stairwells closest to the turnstiles (see Table 9C-5). The 5- and 15-minute analyses reflect average conditions for those periods. However, during these time periods, there are multiple train arrivals which relieve the platform loads by carrying people out of the station and, consequently, the analyses tend to "flatten" out the shorter very congested periods when subway rider loads gather onto the platform just before a subway train arrives. It is during these short periods just before subway trains pull into the station in the 2 or 3 minutes after another train left that crowding is most intense.

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* Each Fare Control Area (FCA) and vertical circulation element in the NYCT subway system has an alphanumeric designation as indicated in this report.

Table 9C-2
EXISTING AM PEAK PERIOD ANALYSIS OF PEDESTRIAN CIRCULATION ELEMENTS WITHIN GRAND CENTRAL TERMINAL

Pedestrian Element		*Peak 5 Minutes within Peak AM 15-Minute Period*		*Peak AM 15-Minute Period*	
Location	**Section**	**Pedestrian Volume**	**LOS**	**Pedestrian Volume**	**LOS**
1. Met Life Building Escalators	3 Up Escalators	1,210	over capacity	3,355	under capacity
	1 Down Escalator	80	under capacity	210	under capacity
2. Graybar Passageway	Corridor	505	B	1,470	B
3. Lexington Ave. Stairs / Escalators	North Stairs from Lower Concourse	125	A	295	A
	South Stairs from Lower Concourse	45	A	110	A
	Up Esc. Facing Hudson News	25	under capacity	60	under capacity
	Down Esc. Facing Hudson News	10	under capacity	25	under capacity
	North Corridor	690	A	1,695	A
	South Corridor	925	C	2,600	B
4. Hyatt Passageway	Corridor	625	B	1,710	B
5. Eastern IRT Subway Stairs	Stairs	695	C	1,775	C
6. Western IRT Subway Stairs / Escalators	Stairs	575	E	1,370	D
	Up Escalator	435	over capacity	890	under capacity
	Down Escalator	295	under capacity	830	under capacity
7. East Passageway to 42nd St. (Park-Lex)	Corridor	1,120	B	3,000	B
8. Lower Concourse East Ramp	Ramp	220	A	490	A
9. 42nd St. Main Entrance	Corridor	330	A	895	A
10. Shuttle Passageway	Corridor	535	B	1,165	A
11. Ramp to Vanderbilt Ave. / 42nd St. Corner	Ramp	335	B	815	A
12. Vanderbilt Ave. Stairs / Escalators	North Stairs from Lower Concourse	195	B	490	B
	South Stairs from Lower Concourse	20	A	50	A
	Up Esc. Facing NYCT Store	215	under capacity	420	under capacity
	Down Esc. Facing NYCT Store	20	under capacity	35	under capacity
	North Corridor	680	B	1,535	A
	South Corridor	615	B	1,460	A
13. 43rd St. Stairs in Biltmore Room	Stairs	245	C	640	B
14. Roosevelt Passageway	Corridor	530	C	1,350	C

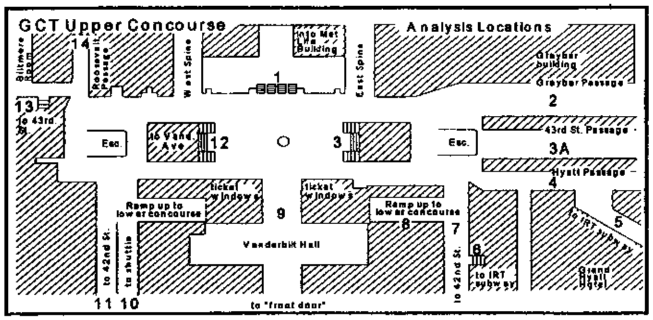

Table 9C-4
Existing AM and PM Peak Period Volume-to-Capacity Ratios of Key GCT Exit Elements

		AM Peak Period			PM Peak Period		
		Person Trips			Person Trips		
GCT-to-Street Elements	Analysis Period	MNR/ Others	LIRR	LOS	MNR/ Others	LIRR	LOS
7 Doors to Vanderbilt Avenue Taxi Stand	15-minute	1,115	N/A	C/D or better	945	N/A	C/D or better
	5-minute	440	N/A		340	N/A	
11 Doors to Vanderbilt Ave. / 42nd St. Corner	15-minute	815	N/A	C/D or better	990	N/A	C/D or better
	5-minute	335	N/A		355	N/A	
7 Doors to Park Ave./42nd St.	15-minute	895	N/A	C/D or better	1,050	N/A	C/D or better
	5-minute	330	N/A		385	N/A	
6 Doors to 42nd St. near Hyatt Hotel	15-minute	890	N/A	C/D or better	845	N/A	C/D or better
	5-minute	320	N/A		335	N/A	
10 Doors to Lexington Ave. from Graybar Passageway	15-minute	1,780	N/A	C/D or better	1,450	N/A	C/D or better
	5-minute	625	N/A		495	N/A	
7 Doors to Lexington Ave. from Hyatt Passageway	15-minute	1,060	N/A	C/D or better	1,370	N/A	C/D or better
	5-minute	385	N/A		465	N/A	
Free Passageway to IRT 4, 5, 6 Fare Control Area #238	15-minute	closed	closed	N/A	closed	closed	N/A
	5-minute	closed	closed	N/A	closed	closed	N/A

LEXINGTON AVENUE SUBWAY CONDITIONS

The analysis of subway conditions focuses on access to the Lexington Avenue subway line—at its mezzanine level and stairwells from the mezzanine level down to the platform level, and its platforms—as well as on line-haul capacity on the Lexington Avenue line (i.e., the capacity of the overall subway line to transport riders), since the Preferred Alternative is expected to increase transfers to that line. The project is similarly expected to reduce demands on the IRT Seventh Avenue lines and the 42nd Street shuttle, since a significant number of LIRR commuters presently using those lines after arriving in Penn Station would no longer use them, but would arrive at GCT instead; these reduced ridership demands, i.e., benefits, are also quantified in this section of the DEIS.

For the analysis of subway platforms, pedestrian LOS standards are applied to peak pedestrian volumes that use the space (the platform) over a given time period. To address how such areas function, the time-space methodology is the standard procedure used to assess platforms and other such waiting areas. The methodology recognizes that people are involved in walking and waiting activities in a given space for a given period of time. The technique models how platforms are used today or would be used in the future if additional platform elements, such as new or relocated stairwells, are introduced.

Initially, acceptable LOS C/D standards* (associated with a v/c ratio of 1.00) are used to calculate stair and passageway walk-space requirements in existing conditions, or walk space requirements when designing a new pedestrian space, such as a platform or waiting area. In cases

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* NYCT's most recent *Station Planning and Design Guidelines (1992)* provide LOS criteria for various station elements, and were used in these analyses.

At Grand Central, each subway platform appears to have certain areas where people tend to congregate no matter how dense crowding becomes. For the 5- and 15-minute periods, two platform zones would function with some congestion, although not as intense as the shorter bursts of pedestrian activity that occur just before a train arrives. These zones are: on the southbound platform, the zone near the south end fed by stair P14; on the northbound platform, the centermost zone in between stairs P17 and P19. Nevertheless, acceptable LOS C/D conditions do prevail in these areas for the 5- and 15-minute analysis periods.

For the station's platform stairwells, 3 of the existing 11 stairwells analyzed operate at LOS E or F during the 5-minute peak period, with 2 others in the LOS D range, including 4 stairwells (P12, 14, 18, 22) leading to the southbound platform and the northernmost stairwell (P23) to the northbound platform. During the 15-minute period, conditions remain congested or approach congestion with several stair elements (P12, 14, 22, 23) at or just below capacity LOS D and E conditions (see Table 9C-6). These conditions do not meet the NYCT acceptable standard of LOS C/D, and indicate two improvements already needed. First, there is a clear need for additional stair elements and a more efficient, uncluttered mezzanine configuration to better load the platform's underutilized areas. Second, should mezzanine and stairwell improvements be made, the ability to process people out of the station with shorter train headways is required because platforms would be loaded quicker. NYCT is currently implementing a number of improvements to decrease dwell times and therefore increase line-haul capacity. This would work in conjunction with proposed platform and mezzanine improvements.

FCA No. 238 operates with two separate circulation areas: one large zone through which people enter and exit the station and purchase tokens, and a second smaller zone that forms between the exit-only turnstiles and the base of the escalator bank in which people queue to enter the up escalator. During the 5-minute AM peak period, the larger zone operates in the congested LOS D/E range, while the smaller zone operates at over capacity LOS E/F, with significant queuing noted. During the 15-minute AM peak period, both zones operate at LOS D/E. The wider bank of 15 turnstiles operate well under capacity (see Table 9C-7).

LEXINGTON AVENUE SUBWAY LINE-HAUL CAPACITY

For line-haul capacity, the ability of trains to accommodate passenger loads is considered. The analysis determines whether there is sufficient capacity per car per train to handle existing and projected future transit loads. The analyses are based on per-car practical capacity standards (seated plus standing loads) used by MTA and NYCT. For the Lexington Avenue line, each subway car has a guideline capacity of 110 passengers and a maximum loading of 160 passengers (i.e., "crush capacity").

Line-haul capacity of a given subway is determined by multiplying the number of scheduled trains per hour by the number of cars per train and times the guideline capacity per car. The volume of riders leaving the 42nd Street station is compared with the line-haul capacity of the subway line and shown as a utilization rate. The resulting per-car passenger load can then be compared with guideline capacity standards to determine the acceptability of conditions.

Utilization rates greater than 1.00 indicate that the subway line is experiencing passenger usage in excess of its capacity.

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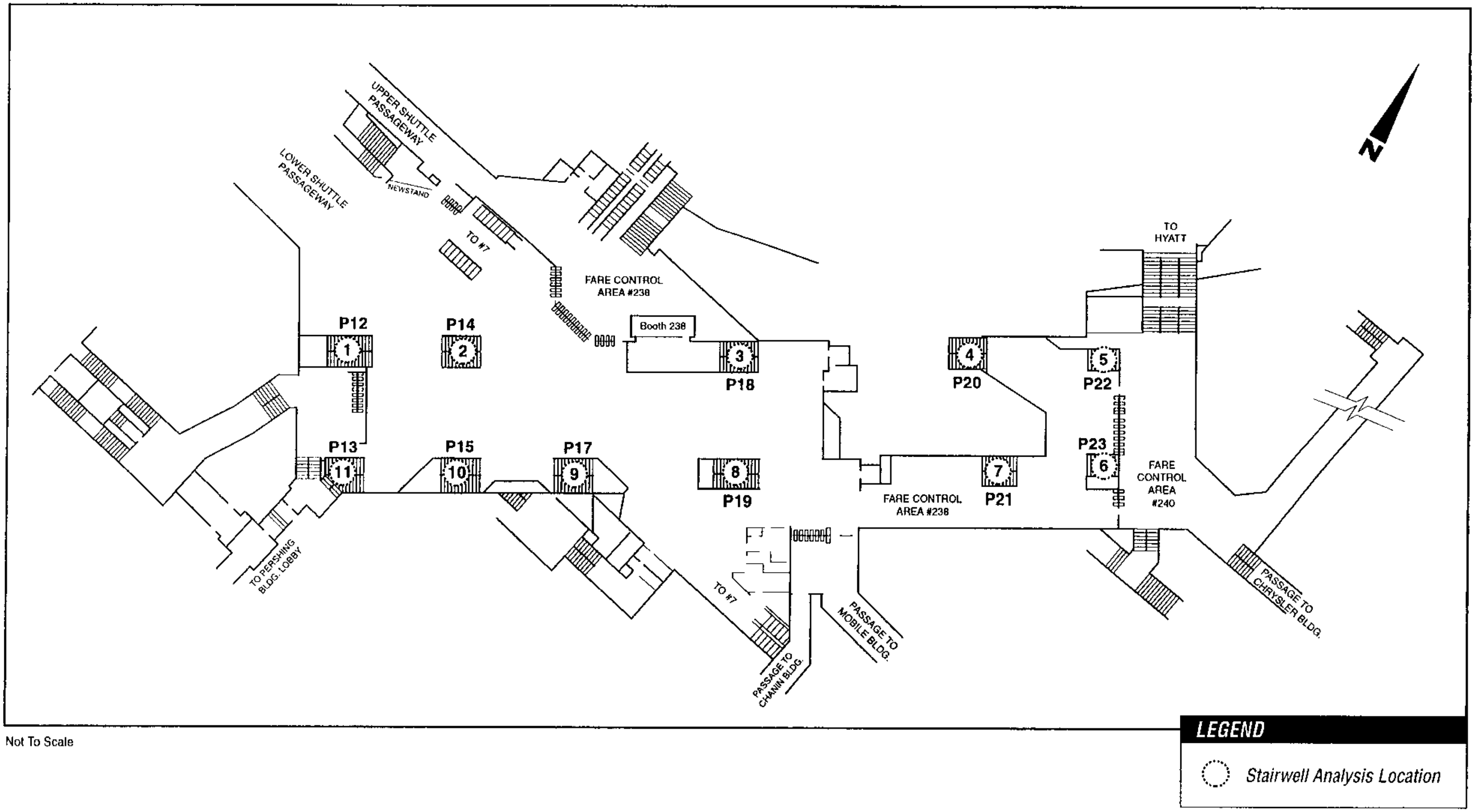


Not To Scale

Figure 9C-3

**Stairwell Analysis Locations:
Lexington Avenue Subway Mezzanine at Grand Central Terminal**

Table 9C-7
EXISTING PEDESTRIAN TIME-SPACE ANALYSES
IRT FARE COLLECTION AREA #238 AT 42nd STREET STATION

Time - Space Zone	Effective Space Available (sq ft)	Number of Pedestrians Walking	Level of Service (LOS)
Peak 5 Minutes within Peak AM 15 - Minute Period			
1	730	575	D/E
2	380	730	E/F
Peak AM 15 - Minute Period			
1	730	1,370	D/E
2	380	1,720	D/E
Peak 5 Minutes within Peak PM 15 - Minute Period			
1	730	560	C/D
2	380	530	C/D
Peak PM 15 - Minute Period			
1	730	1,375	C/D
2	380	1,495	C/D

Period (in mins)	Pedestrian Volume	Turnstile Capacity	V / C Ratio
5 (AM)	1,320	2,600	0.51
15 (AM)	3,120	7,800	0.40
5 (PM)	1,100	2,600	0.42
15 (PM)	2,885	7,800	0.37

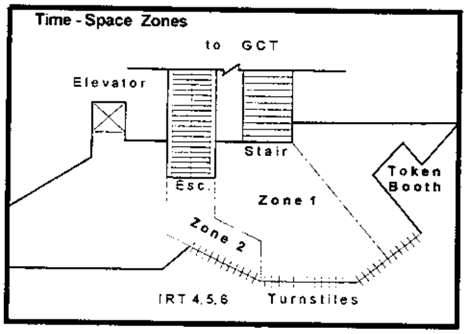
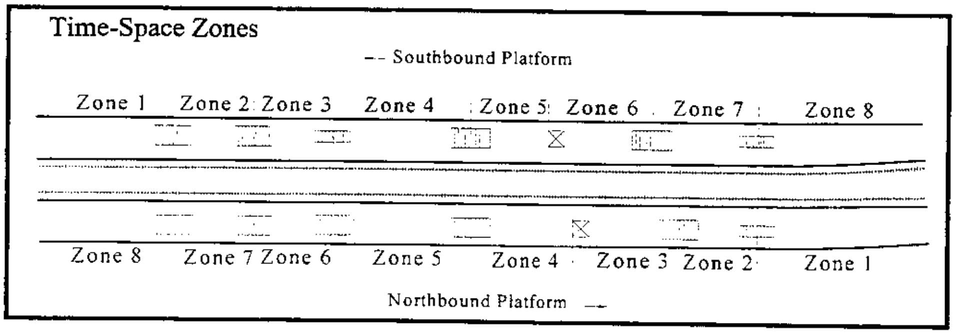


Table 9C-5
EXISTING PEDESTRIAN TIME-SPACE ANALYSES LEXINGTON AVENUE SUBWAY (IRT 4, 5, 6) PLATFORMS AT GRAND CENTRAL TERMINAL

		AM Peak Hour				**PM Peak Hour**			
		Peak 5 Minutes		*Peak 15 Minutes*		*Peak 5 Minutes*		*Peak 15 Minutes*	
Time-Space Zone	**Effective Space Available (sq ft)**	**Number of Passengers Waiting**	**Level of Service**	**Number of Passengers Waiting**	**Level of Service**	**Number of Passengers Waiting**	**Level of Service**	**Number of Passengers Waiting**	**Level of Service**
Northbound IRT Platform									
1	1,115	125	C/D or better	375	C/D or better for all zones	200	C/D or better for all zones	600	C/D or better for all zones
2	580	25	C/D or better	75		50		150	
3	865	50	C/D or better	150		125		375	
4	835	125	C/D or better	375		100		300	
5	970	325	C/D - Mid-D	975		200		600	
6	575	75	C/D or better	225		100		300	
7	550	75	C/D or better	225		100		300	
8	2,165	75	C/D or better	225		400		1,200	
Southbound IRT Platform									
1	1,920	225	C/D or better for all zones	675	C/D or better for all zones	275	C/D or better for all zones	825	C/D or better for all zones
2	570	100		300		125		375	
3	610	50		150		75		225	
4	1,050	175		525		100		300	
5	330	75		225		50		150	
6	810	100		300		100		300	
7	770	100		300		125		375	
8	1,155	125		375		200		600	



1,450 (AM) to 1,250 (PM) traversing 42nd Street. At the 45th Street/Lexington Avenue intersection, the heaviest crossing volumes (2,700) traverse 45th Street, while another 1,150 people cross Lexington Avenue.

Along the north-south crosswalks of Madison Avenue's east side, pedestrian volumes tend to peak between 43rd and 48th Streets which are closest to the terminal: between 1,300 (at 48th) and 2,250 (at 45th) were recorded in the AM; a similar pattern is exhibited in the PM with between 1,650 (at 43rd) and 3,100 (at 45th) crossing pedestrians recorded. Crossing Madison Avenue, between 850 (at 46th) and 1,950 (at 43rd) pedestrian volumes were recorded in the AM, while a similar pattern is shown in the PM peak hour with between 900 (at 46th) and 2,250 (at 45th) pedestrian volumes recorded.

The *HCM* was used as the procedural basis for all pedestrian LOS analyses in the GCT area. On the east side of GCT along Lexington Avenue between 42nd and 45th Streets, there are a number of street corners, crosswalks, and sidewalks that currently operate at capacity LOS E (see Tables 9C-9, 9C-10, and 9C-11). At these locations, sidewalks are narrow overall and are narrowed even further by the presence of large planters. Such conditions are due, in part, to the lack of other pedestrian connections either directly to surrounding buildings or to other street points. Crosswalks are often very congested with large groups of pedestrians, and many people choose to cross midblock in between standing vehicles.

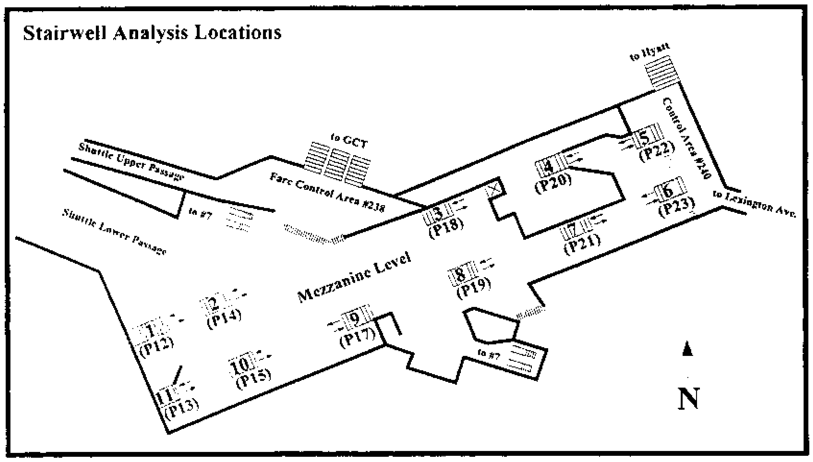
Along Vanderbilt Avenue, pedestrian flows are less intense in their concentrations due, in large part, to the existence of a number of underground connections directly into surrounding buildings to the avenue's immediate west. This allows pedestrians to spread their exit and entrance movements in a more even manner and results in more acceptable pedestrian operations at the street areas surrounding GCT's west edge. Pedestrian conditions at corners and crosswalk are typically in the LOS C to D range, although the 45th Street intersection does show some congestion (LOS E) during the midday and PM peaks on the north and south crosswalks.

Along Madison Avenue between 43rd and 48th Streets, where much of the pedestrian flows are highly directional (northward in the AM, southward in the PM), crosswalks operate with some noticeable congestion (LOS D to E). Similar to the Lexington Avenue side, many people cross Madison Avenue in large platoons in between intersections as signals allow, since corner reservoirs are often too small to accommodate them. Representative cross-street sidewalk LOSs are acceptable, since most of the flows are unidirectional and there are few of the crossing conflicts that occur at the intersection's corners. There are, however, two exceptions of note. The north sidewalk of 43rd Street and the south sidewalk of 45th Street both between Madison and Vanderbilt Avenues operate at LOS D to E in the AM and PM peak hours primarily due to the large volume of moving pedestrians along the somewhat narrow widths. Most of these pedestrian platoons are destined to or from existing GCT entries on 43rd and 45th Streets.

Pedestrian flows along the south side of GCT on 42nd Street have a number of exit points—three from GCT itself and others from the subway complex below. Given such a large number of access locations, pedestrian flows leaving the terminal are spread in several directions. Also, since some people cross midblock along 42nd Street, crowding in the corner reservoirs is minimized, as indicated by LOS D in the AM and PM peak periods at the Vanderbilt and Lexington Avenue corners. On the other hand, the east-west crosswalks at these same corners are highly

Table 9C-6
EXISTING SUBWAY STAIR ANALYSES
LEXINGTON AVENUE SUBWAY (IRT 4, 5, 6) PLATFORMS AT GRAND CENTRAL TERMINAL

Stairwell Number/ Pedestrian Element	AM Peak Hour				PM Peak Hour			
	Peak 5 Minutes		*Peak 15 Minutes*		*Peak 5 Minutes*		*Peak 15 Minutes*	
	Pedestrian Volume	Level of Service	Pedestrian Volume	Level of Service	Pedestrian Volume	Level of Service	Pedestrian Volume	Level of Service
1 (P12)	555	D	1,420	D	180	A	450	A
2 (P14)	615	E	1,575	D	370	C	1,035	C
3 (P18)	560	D	1,310	C	215	B	575	A
4 (P20)	440	C	1,245	C	215	B	540	B
5 (P22)	370	E	905	D	280	D	750	D
6 (P23)	405	F	1,040	E	420	F	870	D
7 (P21)	305	C	760	B	325	C	815	B
8 (P19)	320	C	855	B	240	B	615	B
9 (P17)	240	B	650	B	355	C	930	B
10 (P15)	170	A	445	A	310	B	775	B
11 (P13)	200	B	520	A	370	C	835	B


Stairwell Analysis Locations

For this study, the critical peak direction was analyzed, namely, southbound on the IRT 4/5/6 lines at GCT in the AM peak period when ridership is highest throughout the day (this is consistent with the analysis done within NYCT's Manhattan East Side Transit Alternatives [MESA] MIS/DEIS). Peak period observations were made between 1995 and 1997 of the number of people in subway trains leaving GCT station for the MESA MIS/DEIS. These observations indicated that an average of about 1,120 passengers per 10-car express train and 615 passengers per 10-car local train existed.

These average volumes were increased by 8.5 percent to achieve 1999 passenger volume data. This increase assumed a 0.5 percent growth per year between 1996 and 1998 (1996 represented the midpoint of the 1995 to 1997 observations) and a 7.5 percent growth between 1998-1999 (as indicated by the May 1999 Year-to-Date Average Weekday Subway Registrations provided by NYCT) reflecting, in large part, the introduction of MetroCard discounts. Currently, express and local service at GCT each average 23 trains per hour. As a result, the IRT Nos. 4 and 5 express lines exceed their guideline capacity, with a utilization level of 110 percent, as shown in Table 9C-8. The local No. 6 line operates at about 61 percent utilization.

Table 9C-8

Existing Lexington Avenue Subway Line-Haul Conditions at 42nd Street Grand Central Station Downtown (AM Peak)

Subway Lines	Trains/ Hour	Cars/ Hour	Total Guideline Capacity/Hour (passengers/hour)	Passengers/ Hour	Utilization Rate
Nos. 4 and 5 Express Trains	23	230	25,300	27,925	1.10
No. 6 Local Train	23	230	25,300	15,345	0.61

PEDESTRIAN CONDITIONS AT STREET LEVEL

The pedestrian analysis area outside of GCT focused on the sides of the terminal where pedestrian activities are most pronounced. These include the main Lexington Avenue crossing points at 45th, 43rd, and 42nd Streets as well as the 42nd Street intersections at Lexington and Park Avenues. Each corner along the east side of Madison Avenue between 43rd and 48th Streets, which would be traversed by a significant number of LIRR riders destined to workplaces just to the west, was also analyzed for conditions in their corner reservoir areas and at their crosswalks (see Figure 9C-4). Selected midblock sidewalk locations on cross-streets just east of Madison Avenue were also examined as representative of other such midblock areas.

The analysis of sidewalks and crosswalks surrounding GCT was based on May 1999 counts and field observations conducted at each of the locations cited above, and other recent pedestrian data available from the Bear Stearns DEIS (July 1998). These counts were done before new access points were opened up to GCT at its north end, which was simulated in the No Action condition. The highest pedestrian volumes were recorded across 45th Street between the Met Life building and the Helmsley Walks, with between 8,100 and 9,100 pedestrians tabulated in the respective AM and PM peak hours. Of the four corners of the GCT block, the southeast corner at 42nd Street and Lexington Avenue is the most intensely used. In each of the AM and PM peak hours, 3,000-3,400 people travel east-west across Lexington Avenue, while another 2,900 use the north-south 42nd Street crosswalk. The southwest corner at Vanderbilt Avenue is only slightly less used, with between 4,300 (AM) to 5,600 (PM) pedestrians crossing Vanderbilt and

Table 9C-10

Existing Crosswalk Pedestrian Levels of Service: GCT Study Area

Location	Crosswalk	AM	Midday	PM
Lexington Avenue at 42nd Street	North	E	D	E
	West	E	D	E
Lexington Avenue at 43rd Street	North	E	N/A	N/A
Lexington Avenue at 45th Street	South	C	D	C
	West	E	E	E
Madison Avenue at 43rd Street	North	D	B	D
	East	D	E	D
	South	D	C	C
Madison Avenue at 44th Street	North	C	B	C
	East	D	E	D
	South	C	C	C
Madison Avenue at 45th Street	North	D	C	D
	East	D	D	E
	South	C	C	D
Madison Avenue at 46th Street	North	B	B	B
	East	E	E	E
	South	D	C	C
Madison Avenue at 47th Street	North	B	B	B
	East	D	E	E
	South	C	C	C
Madison Avenue at 48th Street	North	B	B	B
	East	D	E	E
	South	B	B	B
Vanderbilt Avenue at 42nd Street	North	E	E	E
	East	C	B	C
Vanderbilt Avenue at 44th Street	North	D	C	C
	West	C	C	C
Vanderbilt Avenue at 45th Street	North	D	E	D
	East	D	C	C
	South	C	E	E
	West	C	C	C
Vanderbilt Avenue at 46th Street	North	B	C	B
	East	C	D	C
	South	B	D	B
	West	C	C	C
Vanderbilt Avenue at 47th Street	South	C	C	C
	West	C	C	C
Park Avenue at 48th Street	North	B	B	B
	East	E	D	E
	South	B	B	B
	West	C	C	C
Park Avenue at 42nd Street	East	D	C	C
	West	C	C	D

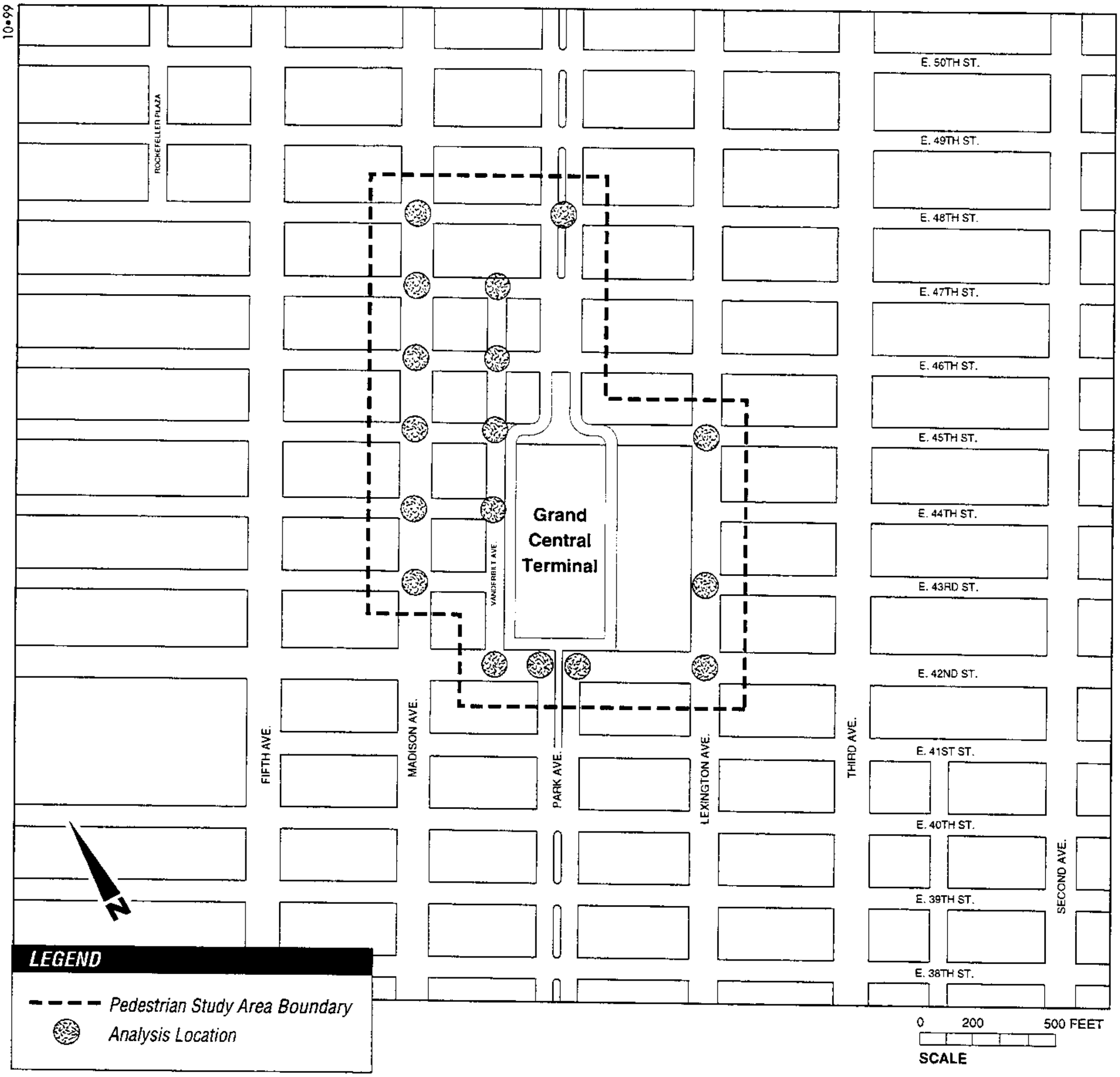


Figure 9C-4

Pedestrian Study Area in Manhattan

M1, M2, M3	Local service along Fifth and Madison Avenues.
M42	Crosstown service along 42nd Street.
M104	Crosstown service along 42nd Street between First and Eighth Avenues, continuing north to the Upper West Side.
M98	Weekday limited rush hour service along Lexington and Third Avenues.
M101, M102, M103	Local service along Lexington and Third Avenues.

The frequency of service on these routes is generally excellent, with the headways on some routes, i.e., the time between bus arrivals, scheduled to be as low as 2 minutes (M42) during peak periods. The M101, M102, and M103 routes are scheduled to provide service with 3-minute headways. The longest headways are on the M3 route with 9 minutes scheduled between buses, although the M1 and M2 also operate on Madison Avenue and, all together, provide excellent frequency of service (every 2-3 minutes on average overall). The frequent nature of bus service results in thousands of travelers arriving and departing the GCT area during the peak hours.

Two bus routes currently provide service between GCT and Penn Station. The M4 route operates primarily along Fifth and Madison Avenues with its southern terminus at Penn Station. This route transports LIRR riders from Penn Station (from 32nd Street just east of Seventh Avenue) to destinations on the East Side. In the AM peak period, extensive queues of bus riders can be seen waiting to board the M4 for their connections to the East Side. The Q32 route provides service from Penn Station to the East Side along the same route as the M4 (eastbound 32nd Street and northbound Madison Avenue away from the Penn Station area; southbound Fifth Avenue and westbound 34th Street to the Penn Station area). The M4 and Q32 share the same bus stops below 60th Street.

NYCT guidelines are designed to ensure that there are enough buses on a given route to accommodate riders during a particular time period. Guidelines have been developed for both “feeder” routes, i.e., routes on which most of the passengers have a common origin or destination, and “grid” routes, which are characterized by a series of significant on/off activities. Most of the routes in the study area are grid routes, and they are discussed below.

The grid route schedule guidelines indicate that buses are expected to accommodate up to a maximum of 60 people during the peak periods, which is approximately 1.5 times the seated capacity of a bus. A bus loaded with more than 60 people would not have the floor space to permit passengers to comfortably maneuver through it for seating or exiting. Consistent with these guidelines, three levels of loading standards have been developed for NYCT buses: seated (less than 40 passengers on a bus); standing (between 41 and 60 passengers per bus); and overcrowded (more than 60 passengers per bus).

Table 9C-12 summarizes bus passenger volumes at the peak load point for each route. As shown, all but one of the bus routes identified within the study area are currently operating within standing capacity, i.e., within a load level of 41 to 60 passengers per bus.

FUTURE CONDITIONS COMMON TO ALL ALTERNATIVES

TRAFFIC

Future traffic growth in the GCT area was established for both vehicle traffic and transit/pedestrian analyses. Vehicular traffic volume growth to the 2010 analysis year was determined using

Table 9C-9
Existing Corner Reservoir Pedestrian Levels of Service: Grand Central Terminal Study Area

Location	Corner	AM	Midday	PM
Lexington Avenue at 42nd Street	Northwest	D	C	D
Lexington Avenue at 45th Street	Southwest	E	E	E
Madison Avenue at 43rd Street	Northeast	D	C	C
	Southeast	D	C	C
Madison Avenue at 44th Street	Northeast	B	C	C
	Southeast	C	D	C
Madison Avenue at 45th Street	Northeast	E	D	E
	Southeast	D	C	D
Madison Avenue at 46th Street	Northeast	B	B	C
	Southeast	D	C	C
Madison Avenue at 47th Street	Northeast	B	B	C
	Southeast	C	C	C
Madison Avenue at 48th Street	Northeast	B	B	C
	Southeast	B	B	B
Vanderbilt Avenue at 42nd Street	Northeast	C	B	C
Vanderbilt Avenue at 44th Street	Northwest	B	B	B
Vanderbilt Avenue at 45th Street	Northwest	C	D	C
	Southwest	B	C	C
	Southeast	B	C	C
Vanderbilt Avenue at 46th Street	Northeast	B	C	B
	Southeast	B	C	B
	Northwest	B	B	B
	Southwest	B	C	B
Vanderbilt Avenue at 47th Street	Southwest	C	B	B
Park Avenue at 48th Street	Northeast	B	B	B
	Southwest	B	B	B

Table 9C-12A
Metro-North Arrivals/Departures from GCT: 1995, 2010, 2020

Time Period	1995 Base	2010	2020
Peak AM Hour	37,117	43,594	45,919
Peak AM Period	74,233	87,188	91,837
Average Weekday	176,675	207,507	218,572

For some pedestrian elements where new station/terminal designs are potentially affected by projected LIRR ridership, analyses examined conditions in the year 2010, the first analysis year; and a second future condition in the year 2020, to ensure that these designs can adequately process established pedestrian demands after the project is completed. These pedestrian facilities include the new LIRR platforms and crosspassageways, elements within GCT itself, and locations in the Lexington Avenue subway. Pedestrian elements outside of GCT, such as along sidewalks and crosswalks which would not be newly designed were examined for only the year 2010.

Two steps were taken to project future pedestrian conditions. First, because both MNR trains and various subway lines enter GCT, different annual background growth rates were identified for each mode and applied to the various pedestrian flows in and through the terminal (i.e., as directed by the responsible agency, 1.1 percent for MNR; 0.5 percent for NYCT subways at Grand Central). Second, previous studies at GCT indicate that as much as a third of all pedestrian flows do not use the rail services there at all, but rather simply use the "terminal box" as but one link on their walking path through Midtown (annual growth of 0.26 percent for pedestrians passing through GCT). Thus, another background growth factor, specific to general Midtown Manhattan conditions, was also used to adjust pedestrian flows in the terminal.

Weighted averages of these growth rates were used at many analysis locations, since some pedestrian flows within GCT are composed of riders from commuter trains, subways, and pass-through pedestrians. At locations where subway and MNR riders mix, a weighted average of 0.85 percent per year was used. At other locations composed of MNR riders and pass-through pedestrians, a weighted average of 0.79 percent per year was used.

Second, during the data collection period in early 1999, GCN was still under construction but was scheduled to be opened later in the same year. Since these new circulation elements would change the paths people use into and through the terminal, estimates of how these pedestrian travel-paths change were needed to proceed with the LOS analyses. Within GCT, the new elements include three new stair/escalator elements between the lower and upper concourses, a new passage to East 43rd Street from the upper concourse, and a reopening of the IRT "free" shuttle corridor. Also, GCT's restoration effort closed the west corridor to the IRT shuttle and two stairwells in the lower concourse. Furthermore, the impact of the GCN elements themselves had been projected in the past by a variety of studies to reduce the passenger volumes into the main concourse by as much as 60 percent, since many work destinations lie north of GCT's 43rd Street north-south midpoint. It should be noted that the physical changes associated with the GCN project do not extend into the subway mezzanine or platform areas.

Table 9C-11
Existing Mid-Block Pedestrian Levels of Service: GCT Study Area

Location	Side	Platoon LOS		
		AM	Midday	PM
Lexington Avenue between 43rd and 44th Streets	West	E	D	E
Madison Avenue between 43rd and 44th Streets	East	C	C	C
Madison Avenue between 44th and 45th Streets	East	B	C	C
Madison Avenue between 45th and 46th Streets	East	D	C	D
Madison Avenue between 46th and 47th Streets	East	C	C	D
Madison Avenue between 47th and 48th Streets	East	C	C	C
Vanderbilt Avenue between 45th and 46th Streets	East	B	B	C
	West	B	B	B
Vanderbilt Avenue between 46th and 47th Streets	East	B	B	B
	West	B	B	B
43rd Street between Madison and Vanderbilt Avenues	North	E	C	D
	South	C	B	C
45th Street between Madison and Vanderbilt Avenues	North	C	C	C
	South	D	D	E
46th Street between Madison and Vanderbilt Avenues	North	B	B	B
	South	B	B	B
47th Street between Park and Lexington Avenues	South	B	B	B
47th Street between Vanderbilt and Park Avenues	North	B	B	B
	South	B	B	B
47th Street between Vanderbilt and Madison Avenues	North	B	B	B
	South	B	B	B
48th Street between Park and Lexington Avenues	North	B	B	B
48th Street between Madison and Park Avenues	South	B	B	B

congested (LOS E) during these same times as these are convergence areas for a number of conflicting flows.

For destinations directly north of GCT through the Met Life building, 45th Street is crossed to access the Helmsley Walks East and West (two arcades that bring pedestrians to the southwest and southeast corners of the Park Avenue/46th Street intersection). In general, pedestrian flows across 45th Street are intense but, because there is no defined crosswalk and the path is rather wide, not significantly congested.

BUSES

Grand Central Terminal is served by some of the most heavily traveled bus corridors in the metropolitan area. Its East Midtown location is well served by frequent and comprehensive bus service by the following bus routes which stop either right at GCT or within one or two blocks of GCT:

In the midday peak hour, 26 of the 54 intersections will operate at overall LOS A or B, 15 at LOS C, 3 at LOS D, and 10 at overall LOS E or F, as opposed to just 1 intersection operating at overall LOS D conditions and 2 at LOS E or F conditions at the present time. Under future No Action conditions, 23 of the 54 intersections will have at least one traffic movement at LOS E or F in the midday peak hour, as opposed to just 12 intersections having similar characteristics under existing conditions.

In the PM peak hour, 34 of the 54 intersections will operate at overall LOS A or B, 8 at LOS C, 2 at LOS D, and 10 at overall LOS E or F, as opposed to just 2 intersections operating at overall LOS D conditions and none at LOS E or F conditions at the present time. Under future No Action conditions, 18 of the 54 intersections will have at least one traffic movement at LOS E or F in the midday peak hour, as opposed to just 8 intersections having similar characteristics under existing conditions.

The detailed intersection-by-intersection LOS findings are presented in Table 9C-14. It is also apparent from the table that many of the intersections expected to be operating at unacceptable LOS E or F conditions, will be characterized by extreme delays as indicated by the LOS F* resulting from the detailed capacity analysis.

Parking

The revitalization of GCT, the construction of the Bear Stearns building at 383 Madison Avenue, and the overall business growth in the Grand Central district will further increase the demand for available curb parking space for loading and unloading vehicles in the No Action condition. Double parking activity, mostly delivery vehicles, widely prevails along numerous east-west streets and could increase as traffic and business demands increase. The City of New York has, at times, increased its enforcement of on-street parking regulations to maintain reasonably adequate traffic flow conditions. Such efforts will continue and could increase depending on future conditions and policy-level decisions.

Pedestrian Conditions in GCT

Some pedestrian conditions will be affected by the growth in commuters and pedestrians through GCT's corridors, stairwells, etc. For some elements not affected by GCN (e.g., IRT stairwells from the upper concourse), conditions will deteriorate significantly, since subway ridership will increase and there will be no change in the number of pedestrians using subway facilities with the introduction of new GCN elements in the GCT area by MNR. At other locations where new GCN pedestrian redistributions will occur, only slight deterioration in LOSs will be expected, since new GCN elements will offset increases in MNR ridership.

For the three GCT passageways leading to Lexington Avenue, acceptable LOS A/B conditions or better will continue during the AM and PM peak periods in 2010 and 2020. All stair/escalator elements leading up from the lower concourse will operate acceptably. The eastern stair bank to the IRT subway from the upper concourse will operate at LOS D, some significant congestion will occur in both AM and PM peak periods in 2010 and 2020. The western IRT stair and escalator elements closer to the center of the terminal's main concourse will deteriorate further into congested LOS F conditions, beginning in 2010 and worsening in 2020 in the peak 5-minute period. Part of this condition can be attributable to the sheer volume of people using these elements versus the ability of the elements to move this volume of people.

Table 9C-12

Existing Bus Ridership Levels: GCT Area

Route	AM Peak Hour			PM Peak Hour		
	No. of Buses	Total Riders	Riders/ Bus	No. of Buses	Total Riders	Riders/ Bus
M1	12	560	47	15	726	48
M2	9	492	55	10	562	56
M3	7	379	54	8	418	52
M42	36	2,300	64	15	831	55
M98	8	440	55	6	314	52
M101/102/103	24	1,328	55	23	1,214	53
M104	19	839	44	20	939	47
M4	16	838	52	14	734	52
Q32	8	369	46	8	420	53

Source: NYC Transit 1997 Bus Route Profiles.

a background growth rate of 0.5 percent per year to reflect journey-to-work traffic increases, which includes work trips expected to be made to the 383 Madison Avenue office tower currently under construction at Madison Avenue between 46th and 47th Streets. Also included within the background traffic growth was retail and entertainment generated traffic assumed from the 42nd Street Redevelopment Plan, as documented within the traffic and environmental studies completed for that major project.

For traffic impact analyses under projected future No Action and Preferred Alternative conditions, significant impact criteria for the Midtown Manhattan (and Sunnyside) area analyses were defined as follows based on the criteria used in the recently completed MESA MIS/DEIS and the Route 9A Reconstruction Project EIS: 1) No Action LOS A, B, C, or D deteriorating to LOS E or F under the Build condition providing that the average vehicle delay increase is 10 seconds or more; 2) No Action LOS E deteriorating to LOS F for the Build condition providing that the average vehicle delay increases by 10 seconds or more. Deterioration from the No Action condition to the Build condition within either LOS E or F with 10 seconds or more of additional delay is defined as a significant worsening of a pre-existing problem.

COMMUTER RAIL—METRO-NORTH

Forecasts indicate that Metro-North's future ridership will grow approximately 17 percent from 1995 to 2010, and 24 percent to 2020 (see Table 9C-12A). Current plans call for Metro-North to increase its level of peak hour and peak period service to accommodate future ridership levels. This would be accomplished by increasing the number of scheduled trains arriving at and departing from GCT during peak periods, and, where platform capacity exists, increasing the number of rail cars on peak period trains.

PEDESTRIAN CONDITIONS

For transit and pedestrian flow analyses, new access paths and horizontal and vertical circulation elements being implemented by MNR as part of its GCN plan were taken into account, along with general background pedestrian volume growth and pedestrian volumes generated by the building at 383 Madison Avenue oriented to and within the GCT complex.

Table 9C-14 (continued)
Existing Traffic Level of Service Summaries: GCT Study Area

Intersection	AM Peak Hour		Midday Peak Hour		PM Peak Hour	
	LOS	Critical Movements with LOS E or F	LOS	Critical Movements with LOS E or F	LOS	Critical Movements with LOS E or F
Lexington Ave. and 42nd St.	F*	All movements (LOS F*)	D	—	D	Lexington Ave. (LOS E)
Lexington Ave. and 41st St.	D	—	B	—	B	—
Lexington Ave. and 40th St.	B	—	B	—	B	—
Third Ave. and 40th St.	B	—	B	—	B	—
Third Ave. and 41st St.	B	41st WB (LOS E)	B	—	B	41st WB (LOS E)
Third Ave. and 42nd St.	F*	Third Ave. NB left/throughs and 42nd St. WB rights (LOS F*)	F*	Third Ave. NB rights and 42nd St. WB rights (LOS F*)	F*	42nd St. WB rights (LOS F*)
Third Ave. and 43rd St.	F*	43rd St. WB (LOS F*)	B	43rd St. WB (LOS E)	B	43rd St. WB (LOS F)
Third Ave. and 44th St.	B	—	B	-	B	—
Third Ave. and 45th St.	B	45th St. WB rights (LOS F)	B	45th St. WB (LOS E)	B	45th St. WB (LOS E)
Third Ave. and 46th St.	B	46th St. EB (LOS F)	C	—	B	—
Third Ave. and 47th St.	B	—	F*	47th St. WB (LOS F*)	F*	47th St. WB (LOS F*)
Third Ave. and 48th St.	F*	48th St. EB (LOS F*)	C	48th St. EB (LOS F)	B	—
Second Ave. and 42nd St.	F*	42nd St. WB (LOS F*)	C	-	C	—
First Ave. and 42nd St.	F*	42nd St. EB lefts and 42nd St. WB rights (LOS F*)	C	42nd St. EB lefts (LOS E)	F*	42nd St. EB lefts and 42nd St. WB rights (LOS F*)

Note: * Indicates unsignalized intersection.

Elsewhere in GCT, the Met Life building escalators will have a significant improvement in the AM and PM peak periods in both 2010 and 2020, having conditions with volumes well under their capacity, primarily due to the diversion of commuters to other GCN circulation elements. The Roosevelt passageway will improve to acceptable LOSs during both AM and PM peak periods with the decrease of diverted commuters to other elements in GCT in 2010 and 2020. The 43rd Street stairs leading out from the Biltmore Room will continue to function acceptably during both daily peak periods in both analysis years. All doorways to exterior sidewalks will continue to function at acceptable LOSs or better (see Tables 9C-15 through 9C-20).

Pedestrian conditions when train delays (i.e., no departures) occur were examined in the 47th Street crosspassage using the time-space procedures as described earlier. In the first 15 minutes after a delay, some slight congestion would occur, building to and deteriorating into near-capacity conditions should a delay extend to a full 30 minutes. For the sole use of the crosspassage by MNR riders in the future No Action condition, the threshold of capacity would be crossed 40 minutes after the first train delays would occur.

Lexington Avenue Subway Conditions

Conditions within this station were analyzed for the peak 5- and 15-minute periods, which are the standard analysis periods for transit facilities, and it was determined that the subway station's platform stairwells will continue to experience heavy use. During the 5- and 15-minute periods, conditions will remain congested with several stair elements in LOS F and others at or just below capacity LOS D and E conditions. Similar congestion will prevail during the PM peak period, although it will be slightly less intense than those of the morning hours. Also, the congestion will tend to increase, but not be as intense as in the AM, on the northbound stairwells

To estimate these potential changes in pedestrian travel before GCN opened, a number of "tracings" were conducted at decision points directly outside and along nearby sidewalk locations. Directly outside GCT, field staff followed, or traced, random groups of people exiting from GCT and noted their walk path from a number of key locations to gauge the potential portion of all existing GCT exiters heading north of the terminal as the potential GCN user group. These tracings were conducted from the Graybar and Hyatt Passageways, from the Biltmore Room exit onto 43rd Street, and into and through the Met Life building across 45th Street. This is a potential *maximum* pool of users, since some pedestrians would likely continue to enter GCT itself for any number of reasons and then travel north out of the terminal.

For the analysis of on-street pedestrian conditions, a background growth factor of 0.25 percent per year was used, consistent with rates used in other recent Midtown studies. Also, changes in pedestrian patterns resulting from new GCN elements were also incorporated within the analyses.

For pedestrian impact analyses under the No Action and Preferred Alternatives, significant impact criteria vary depending on the type of pedestrian element (i.e., stair, corridor, etc.). These criteria are discussed in subsequent sections but, in general, LOS C/D is used as the guideline for acceptable pedestrian conditions, specified in NYCT design guidelines. For on-street pedestrian flows, significant impacts relate to specific decreases in square footage per pedestrian by LOS (documented later in this section of the DEIS).

PROBABLE IMPACTS OF PROJECT ALTERNATIVES

NO ACTION ALTERNATIVE

Traffic

Under the No Action Alternative, traffic conditions are expected to deteriorate substantially as background traffic increases throughout the study area. As shown in Table 9C-13, overall, under future No Action conditions, 28 of the 54 intersections will operate at overall LOS A or B conditions in the AM peak hour, 7 will be at LOS C, 4 at LOS D, and 15 will be at overall LOS E or F. This represents a significant deterioration from existing conditions, characterized by 7 intersections at overall LOS D and just 1 at LOS E or F. The analysis also indicates that 22 of the 54 intersections will have at least one traffic movement at unacceptable LOS E or F, as opposed to 14 intersections having similar characteristics under existing conditions.

Table 9C-13

Traffic Level of Service Summary Comparison: Existing vs. Future No Action Conditions

	Existing Peak Hours			No Action Peak Hours		
	AM	Midday	PM	AM	Midday	PM
Intersections at Overall LOS A/B	34	31	37	28	26	34
Intersections at Overall LOS C	12	20	15	7	15	8
Intersections at Overall LOS D	7	1	2	4	3	2
Intersections at Overall LOS E/F	1	2	0	15	10	10
Intersections with Movements at LOS E or F	14	12	8	22	23	18

Table 9C-16
2010 NO ACTION PM PEAK PERIOD ANALYSIS OF PEDESTRIAN CIRCULATION ELEMENTS WITHIN GRAND CENTRAL TERMINAL

Pedestrian Element		*Peak 5 Minutes within Peak PM 15-Minute Period*		*Peak PM 15-Minute Period*	
Location	**Section**	**Pedestrian Volume**	**LOS**	**Pedestrian Volume**	**LOS**
1. Met Life Building Escalators	1 Up Escalator	180	under capacity	480	under capacity
	3 Down Escalators	545	under capacity	1,600	under capacity
2. Graybar Passageway	Corridor	295	A	845	A
3. Lexington Ave. Stairs / Escalators	North Stairs from Lower Concourse	105	A	130	A
	South Stairs from Lower Concourse	45	A	255	A
	Up Esc. Facing Hudson News	5	under capacity	20	under capacity
	Down Esc. Facing Hudson News	70	under capacity	180	under capacity
	North Corridor	645	A	1,725	A
	South Corridor	905	C	2,595	B
3A. 43rd Street Passageway	Corridor	210	A	570	A
4. Hyatt Passageway	Corridor	345	A	945	A
5. Eastern IRT Subway Stairs	Stairs	690	C	1,770	C
6. Western IRT Subway Stairs / Escalators	Stairs	560	F	1,400	E
	Up Escalator	210	under capacity	570	under capacity
	Down Escalator	310	under capacity	900	under capacity
7. East Passageway to 42nd St. (Park-Lex)	Corridor	1,040	B	2,665	B
8. Lower Concourse East Ramp	Ramp	110	A	270	A
9. 42nd St. Main Entrance	Corridor	410	A	1,110	A
10. Shuttle Passageway	Corridor	645	B	1,660	B
11. Ramp to Vanderbilt Ave. / 42nd St. Corner	Ramp	395	B	1,175	B
12. Vanderbilt Ave. Stairs / Escalators	North Stairs from Lower Concourse	205	B	540	B
	South Stairs from Lower Concourse	20	A	40	A
	Up Esc. Facing NYCT Store	5	under capacity	20	under capacity
	Down Esc. Facing NYCT Store	120	under capacity	135	under capacity
	North Corridor	575	A	1,585	A
	South Corridor	555	A	1,585	A
13. 43rd St. Stairs in Biltmore Room	Stairs	145	B	415	A
14. Roosevelt Passageway	Corridor	100	A	305	A

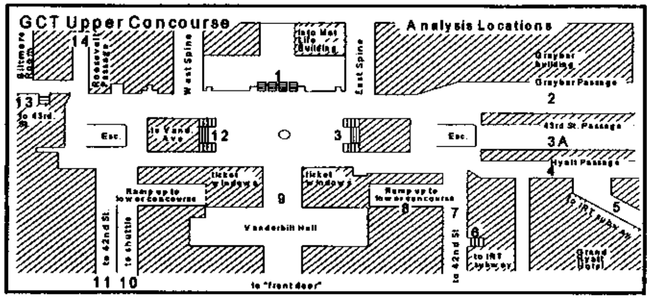


Table 9C-14

Existing Traffic Level of Service Summaries: GCT Study Area

Intersection	AM Peak Hour		Midday Peak Hour		PM Peak Hour	
	LOS	Critical Movements with LOS E or F	LOS	Critical Movements with LOS E or F	LOS	Critical Movements with LOS E or F
Seventh Ave. and 42nd St.	F*	Seventh Ave. SB (LOS F*)	C	—	C	—
Broadway and 42nd St.	F*	42nd St. WB (LOS F*)	F*	42nd St. WB (LOS F*)	F*	42nd St. WB (LOS F*)
Sixth Ave. and 42nd St.	F*	Sixth Ave. left/throughs (LOS E) and 42nd St. WB rights (LOS F*)	F*	42nd St. WB rights (LOS F*)	F*	Sixth Ave. NB and 42nd St. WB rights (LOS F*)
Fifth Ave. and 48th St.	B	—	B	—	B	—
Fifth Ave. and 47th St.	B	—	B	—	B	—
Fifth Ave. and 46th St.	B	—	B	—	B	—
Fifth Ave. and 45th St.	B	—	C	45th St. WB (LOS F)	B	—
Fifth Ave. and 44th St.	B	—	B	-	B	—
Fifth Ave. and 43rd St.	B	—	F*	43rd St. WB (LOS F*)	B	—
Fifth Ave. and 42nd St.	F*	42nd St. WB (LOS F*)	D	42nd St. WB (LOS E)	F*	42nd St. WB (LOS F*)
Fifth Ave. and 41st St.	B	—	B	—	B	—
Fifth Ave. and 40th St.	B	—	B	—	B	—
Madison Ave. and 40th St.	B	—	C	—	B	—
Madison Ave. and 41st St.	C	—	C	—	B	—
Madison Ave. and 42nd St.	F*	42nd St. EB (LOS F*)	F*	42nd St. EB (LOS F*)	D	42nd St. EB (LOS E)
Madison Ave. and 43rd St.	B	—	B	—	B	—
Madison Ave. and 44th St.	C	—	B	—	B	—
Madison Ave. and 45th St.	B	—	C	45th St. WB (LOS E)	B	—
Madison Ave. and 46th St.	B	—	C	46th St. WB (LOS E)	B	—
Madison Ave. and 47th St.	B	—	B	—	B	—
Madison Ave. and 48th St.	B	—	B	—	B	—
Vanderbilt Ave. and 47th St.	C	—	C	—	B	—
Vanderbilt Ave. and 46th St.	B	—	B	—	B	—
Vanderbilt Ave. and 45th St.	D	Vanderbilt Ave. NB (LOS F)	B	—	C	—
Vanderbilt Ave. and 44th St.*	A-B	—	A-B	—	A-B	—
Vanderbilt Ave. and 43rd St.*	A-B	—	A-B	—	A-B	—
Vanderbilt Ave. and 42nd St.	C	—	C	—	C	—
Park Ave. and 40th St.	C	40th St. EB left/throughs (LOS E)	B	—	F*	40th St. EB (LOS F*)
Park Ave. SB and 41st St.	B	—	B	—	C	—
Park Ave. NB and 41st St.	B	—	B	—	B	—
Park Ave. and 42nd St.	F*	Park Ave. NB rights (LOS F) and 42nd St. EB (LOS F*)	F*	Park Ave NB rights and 42nd St. EB rights (LOS F*)	F*	Park Ave. NB rights (LOS F) and 42nd St. EB rights (LOS F*)
Park Ave. and 46th St.	F*	Park Ave. SB lefts (LOS F*) and throughs (LOS E)	F*	Park Ave. SB lefts (LOS F*)	F*	Park Ave. SB lefts (LOS F*)
Park Ave. and 47th St.	C	Park Ave. SB rights (LOS E)	B	Park Ave. NB lefts (LOS F)	B	Park Ave. NB lefts (LOS E)
Park Ave. and 48th St.	F*	Park Ave. SB lefts (LOS F*)	C	Park Ave. SB lefts and 48th St. EB (LOS E)	C	Park Ave. SB lefts (LOS E)
Lexington Ave. and 48th St.	B	—	C	—	B	—
Lexington Ave. and 47th St.	D	—	D	47th St. WB (LOS E)	B	—
Lexington Ave. and 46th St.	B	—	C	46th St. EB (LOS E)	B	—
Lexington Ave. and 45th St.	F*	Lexington Ave. (LOS F*)	F*	Lexington Ave. (LOS F*)	C	—
Lexington Ave. and 44th St.	C	-	F*	Lexington Ave. (LOS F*)	E	Lexington Ave. (LOS E)
Lexington Ave. and 43rd St.	D	43rd St. WB (LOS E)	B	43rd St. WB (LOS E)	C	43rd St. WB (LOS E)

Table 9C-18
2020 NO ACTION PM PEAK PERIOD ANALYSIS OF PEDESTRIAN CIRCULATION ELEMENTS WITHIN GRAND CENTRAL TERMINAL

Pedestrian Element		*Peak 5 Minutes within Peak PM 15-Minute Period*		*Peak PM 15-Minute Period*	
Location	**Section**	**Pedestrian Volume**	**LOS**	**Pedestrian Volume**	**LOS**
1. Met Life Building Escalators	1 Up Escalator	185	under capacity	490	under capacity
	3 Down Escalators	590	under capacity	1,730	under capacity
2. Graybar Passageway	Corridor	330	A	1,185	A
3. Lexington Ave. Stairs / Escalators	North Stairs from Lower Concourse	110	A	125	A
	South Stairs from Lower Concourse	50	A	270	A
	Up Esc. Facing Hudson News	5	under capacity	20	under capacity
	Down Esc. Facing Hudson News	75	under capacity	185	under capacity
	North Corridor	705	A	1,825	A
	South Corridor	975	C	2,785	C
3A. 43rd Street Passageway	Corridor	220	A	635	A
4. Hyatt Passageway	Corridor	375	A	1,030	A
5. Eastern IRT Subway Stairs	Stairs	740	D	1,840	C
6. Western IRT Subway Stairs / Escalators	Stairs	590	F	1,465	E
	Up Escalator	235	under capacity	635	under capacity
	Down Escalator	325	under capacity	945	under capacity
7. East Passageway to 42nd St. (Park-Lex)	Corridor	1,115	B	2,850	B
8. Lower Concourse East Ramp	Ramp	115	A	280	A
9. 42nd St. Main Entrance	Corridor	435	A	1,185	A
10. Shuttle Passageway	Corridor	695	B	1,715	B
11. Ramp to Vanderbilt Ave. / 42nd St. Corner	Ramp	440	B	1,225	B
12. Vanderbilt Ave. Stairs / Escalators	North Stairs from Lower Concourse	230	C	545	B
	South Stairs from Lower Concourse	20	A	55	A
	Up Esc. Facing NYCT Store	5	under capacity	20	under capacity
	Down Esc. Facing NYCT Store	130	under capacity	135	under capacity
	North Corridor	640	A	1,630	A
	South Corridor	605	B	1,725	A
13. 43rd St. Stairs in Biltmore Room	Stairs	160	B	430	A
14. Roosevelt Passageway	Corridor	110	A	310	A

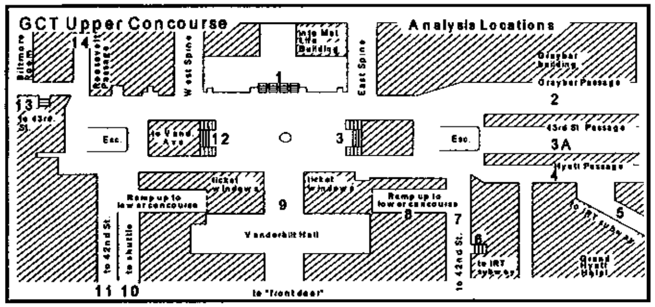


Table 9C-15
2010 NO ACTION AM PEAK PERIOD ANALYSIS OF PEDESTRIAN CIRCULATION ELEMENTS WITHIN GRAND CENTRAL TERMINAL

Pedestrian Element		*Peak 5 Minutes within Peak AM 15 - Minute Period*		*Peak AM 15 - Minute Period*	
Location	**Section**	**Pedestrian Volume**	**LOS**	**Pedestrian Volume**	**LOS**
1. Met Life Building Escalators	3 Up Escalators	900	under capacity	2,500	under capacity
	1 Down Escalator	75	under capacity	195	under capacity
2. Graybar Passageway	Corridor	275	A	780	A
3. Lexington Ave. Stairs / Escalators	North Stairs from Lower Concourse	130	A	295	A
	South Stairs from Lower Concourse	50	A	120	A
	Up Esc. Facing Hudson News	25	under capacity	55	under capacity
	Down Esc. Facing Hudson News	10	under capacity	30	under capacity
	North Corridor	625	A	1,490	A
	South Corridor	940	C	2,655	B
3A. 43rd Street Passageway	Corridor	270	A	730	A
4. Hyatt Passageway	Corridor	525	B	1,185	A
5. Eastern IRT Subway Stairs	Stairs	750	D	1,915	C
6. Western IRT Subway Stairs / Escalators	Stairs	575	F	1,475	E
	Up Escalator	435	over capacity	935	under capacity
	Down Escalator	250	under capacity	760	under capacity
7. East Passageway to 42nd St. (Park-Lex)	Corridor	1,085	B	2,900	B
8. Lower Concourse East Ramp	Ramp	115	A	255	A
9. 42nd St. Main Entrance	Corridor	345	A	940	A
10. Shuttle Passageway	Corridor	710	B	1,545	B
11. Ramp to Vanderbilt Ave. / 42nd St. Corner	Ramp	370	B	910	A
12. Vanderbilt Ave. Stairs / Escalators	North Stairs from Lower Concourse	210	B	525	B
	South Stairs from Lower Concourse	20	A	60	A
	Up Esc. Facing NYCT Store	110	under capacity	155	under capacity
	Down Esc. Facing NYCT Store	25	under capacity	40	under capacity
	North Corridor	545	A	1,195	A
	South Corridor	615	B	1,445	A
13. 43rd St. Stairs in Biltmore Room	Stairs	185	B	480	B
14. Roosevelt Passageway	Corridor	130	A	295	A

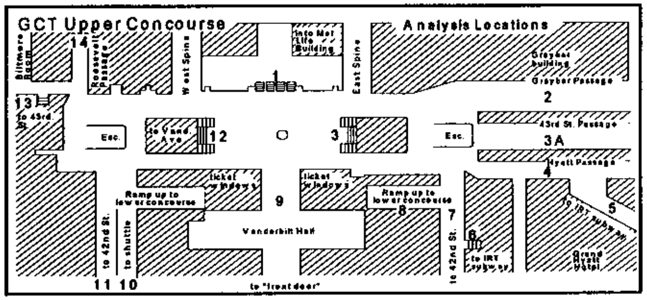


Table 9C-20
2020 No Action AM and PM Peak Period Volume-to-Capacity Ratios of Key GCT Exit Elements

		AM Peak Period			PM Peak Period		
		Person Trips			Person Trips		
GCT-to-Street Elements	Analysis Period	MNR/ Others	LIRR	LOS	MNR/ Others	LIRR	LOS
7 Doors to Vanderbilt Avenue Taxi Stand	15-minute	1,335	N/A	C/D	1,130	N/A	C/D
	5-minute	530	N/A	C/D	405	N/A	C/D
11 Doors to Vanderbilt Ave./42nd St. Corner	15-minute	1,000	N/A	C/D	1,225	N/A	C/D
	5-minute	415	N/A	C/D	440	N/A	C/D
7 Doors to Park Ave./42nd St.	15-minute	1,005	N/A	C/D	1,185	N/A	C/D
	5-minute	375	N/A	C/D	435	N/A	C/D
6 Doors to 42nd St. near Hyatt Hotel	15-minute	1,065	N/A	C/D	1,010	N/A	C/D
	5-minute	380	N/A	C/D	400	N/A	C/D
10 Doors to Lexington Ave. from Graybar Passageway	15-minute	1,180	N/A	C/D	860	N/A	C/D
	5-minute	410	N/A	C/D	305	N/A	C/D
4 Doors to Lexington Ave. from New 43rd Street Passageway	15-minute	825	N/A	C/D	635	N/A	C/D
	5-minute	300	N/A	C/D	230	N/A	C/D
7 Doors to Lexington Ave. from Hyatt Passageway	15-minute	530	N/A	C/D	1,015	N/A	C/D
	5-minute	195	N/A	C/D	340	N/A	C/D
Free Passageway to IRT 4, 5, 6 Fare Control Area #238	15-minute	N/A	N/A	N/A	270	N/A	C/D
	5-minute	N/A	N/A	N/A	110	N/A	C/D
North End Access Exits							
NE Corner of Park Ave/ 48th St. (at Westvaco Building)	15-minute	1,060	N/A	C/D	900	N/A	C/D
	5-minute	465	N/A	C/D	395	N/A	C/D
47th St. between Park and Lexington Avenues (at Bear Stearns Building)	15-minute	662	N/A	C/D	560	N/A	C/D
	5-minute	290	N/A	C/D	245	N/A	C/D
47th St. between Madison and Vanderbilt Avenues (north side of 47th Street)	15-minute	800	N/A	C/D	680	N/A	C/D
	5-minute	350	N/A	C/D	295	N/A	C/D
Madison Ave./47th St. (inside Bear Stearns Building)	15-minute	745	N/A	C/D	635	N/A	C/D
	5-minute	325	N/A	C/D	275	N/A	C/D

as the northbound flows peak out of the 4/5/6 subway lines. The prevailing LOSs will be C or better in both 2010 and 2020 for the 5- and 15-minute peak periods for four of the six stairwells leading up from the northbound platform, although one other stairwell (the northernmost, P23) will operate in LOS F (see Tables 9C-21 and 9C-22). The platforms will continue to remain crowded in the areas close to the heaviest stair movements, although over a 5- to 15-minute period when trains constantly move people out of the station to other downtown stations, all zones will operate at LOS C/D or better. Conditions will be more pronounced on the platform during the short-term peaks just before trains pull into the station, and on some stairwells.

Congestion will become intense on the stairwells leading up from the northbound subway platform in the PM periods as northbound subways carry heavier volumes into GCT. Four zones, spaced throughout the platform, will operate at LOS mid-D to E, with the centermost zone experiencing the heaviest congestion. In the AM peaks, the northbound's main source of congestion will continue to occur in the centermost zone (LOS D/E) for the peak 15-minute AM periods. All other zones on the northbound platform will operate within acceptable levels (see

Table 9C-17
2020 NO ACTION AM PEAK PERIOD ANALYSIS OF PEDESTRIAN CIRCULATION ELEMENTS WITHIN GRAND CENTRAL TERMINAL

Pedestrian Element		*Peak 5 Minutes within Peak AM 15 - Minute Period*		*Peak AM 15 - Minute Period*	
Location	**Section**	**Pedestrian Volume**	**LOS**	**Pedestrian Volume**	**LOS**
1. Met Life Building Escalators	3 Up Escalators	975	under capacity	2,705	under capacity
	1 Down Escalator	80	under capacity	195	under capacity
2. Graybar Passageway	Corridor	300	A	865	A
3. Lexington Ave. Stairs / Escalators	North Stairs from Lower Concourse	145	B	330	A
	South Stairs from Lower Concourse	50	A	130	A
	Up Esc. Facing Hudson News	25	under capacity	60	under capacity
	Down Esc. Facing Hudson News	10	under capacity	30	under capacity
	North Corridor	685	B	1,625	A
	South Corridor	1,010	C	2,855	C
3A. 43rd Street Passageway	Corridor	295	A	825	A
4. Hyatt Passageway	Corridor	480	A	1,280	A
5. Eastern IRT Subway Stairs	Stairs	805	D	2,055	C
6. Western IRT Subway Stairs / Escalators	Stairs	625	F	1,605	E
	Up Escalator	435	over capacity	975	under capacity
	Down Escalator	280	under capacity	815	under capacity
7. East Passageway to 42nd St. (Park-Lex)	Corridor	1,170	B	3,210	B
8. Lower Concourse East Ramp	Ramp	125	A	285	A
9. 42nd St. Main Entrance	Corridor	375	A	1,005	A
10. Shuttle Passageway	Corridor	765	B	1,680	B
11. Ramp to Vanderbilt Ave. / 42nd St. Corner	Ramp	415	B	1,000	B
12. Vanderbilt Ave. Stairs / Escalators	North Stairs from Lower Concourse	235	C	585	B
	South Stairs from Lower Concourse	20	A	70	A
	Up Esc. Facing NYCT Store	125	under capacity	175	under capacity
	Down Esc. Facing NYCT Store	25	under capacity	45	under capacity
	North Corridor	610	A	1,325	A
	South Corridor	670	B	1,575	A
13. 43rd St. Stairs in Biltmore Room	Stairs	205	B	535	B
14. Roosevelt Passageway	Corridor	140	A	330	A

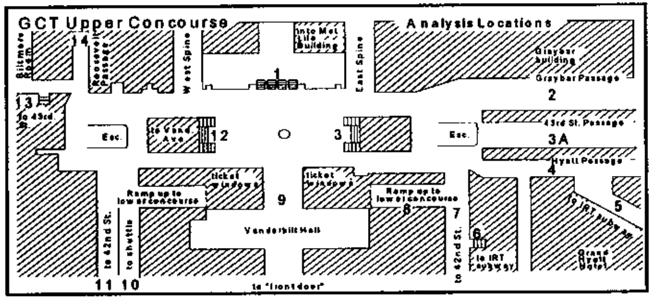


Table 9C-22
2020 NO ACTION SUBWAY STAIR ANALYSES LEXINGTON AVENUE SUBWAY (IRT 4, 5, 6) PLATFORMS AT GRAND CENTRAL TERMINAL

Stairwell Number/ Pedestrian Element	AM Peak Hour				PM Peak Hour			
	Peak 5 Minutes		*Peak 15 Minutes*		*Peak 5 Minutes*		*Peak 15 Minutes*	
	Pedestrian Volume	**Level of Service**	**Pedestrian Volume**	**Level of Service**	**Pedestrian Volume**	**Level of Service**	**Pedestrian Volume**	**Level of Service**
1 (P12)	650	E	1,645	D	205	B	515	A
2 (P14)	735	F	1,895	E	410	D	1,060	C
3 (P18)	655	E	1,535	D	250	B	670	B
4 (P20)	515	D	1,450	D	240	B	615	B
5 (P22)	430	F	1,045	E	310	E	835	D
6 (P23)	450	F	1,160	F	495	F	1,035	E
7 (P21)	335	C	845	C	390	C	975	C
8 (P19)	370	C	985	C	285	B	710	B
9 (P17)	280	B	780	B	410	C	1,080	C
10 (P15)	195	A	525	A	360	C	895	B
11 (P13)	210	B	580	B	430	C	968	C

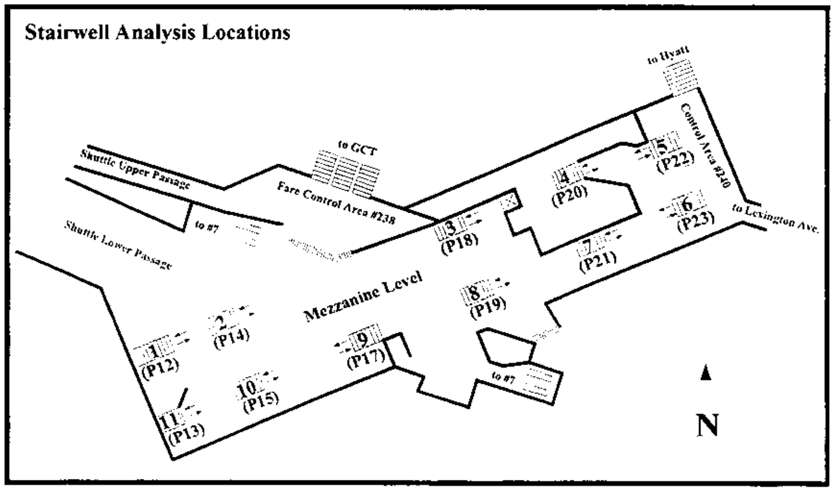


Table 9C-19
2010 No Action AM and PM Peak Period Volume-to-Capacity Ratios of Key GCT Exit Elements

		AM Peak Period			PM Peak Period		
		Person Trips			Person Trips		
GCT-to-Street Elements	**Analysis Period**	**MNR/ Others**	**LIRR**	**LOS**	**MNR/ Others**	**LIRR**	**LOS**
7 Doors to Vanderbilt Avenue Taxi Stand	15-minute	1,225	N/A	C/D	1,035	N/A	C/D
	5-minute	485	N/A	C/D	375	N/A	C/D
11 Doors to Vanderbilt Ave./42nd St. Corner	15-minute	910	N/A	C/D	1,175	N/A	C/D
	5-minute	370	N/A	C/D	395	N/A	C/D
7 Doors to Park Ave./42nd St.	15-minute	940	N/A	C/D	1,110	N/A	C/D
	5-minute	345	N/A	C/D	370	N/A	C/D
6 Doors to 42nd St. near Hyatt Hotel	15-minute	980	N/A	C/D	930	N/A	C/D
	5-minute	350	N/A	C/D	370	N/A	C/D
10 Doors to Lexington Ave. from Graybar Passageway	15-minute	1,075	N/A	C/D	780	N/A	C/D
	5-minute	375	N/A	C/D	275	N/A	C/D
4 Doors to Lexington ave. from New 43rd St. Passageway	15-minute	755	N/A	C/D	580	N/A	C/D
	5-minute	275	N/A	C/D	210	N/A	C/D
7 Doors to Lexington Ave. from Hyatt Passageway	15-minute	485	N/A	C/D	930	N/A	C/D
	5-minute	185	N/A	C/D	310	N/A	C/D
Free Passageway to IRT 4, 5, 6 Fare Control Area #238	15-minute	295	N/A	C/D	295	N/A	C/D
	5-minute	140	N/A	C/D	100	N/A	C/D
North End Access Exits							
NE Corner of Park Ave/ 48th St. (at Westvaco Building)	15-minute	955	N/A	C/D	815	N/A	C/D
	5-minute	415	N/A	C/D	355	N/A	C/D
47th St. between Park and Lexington Avenues (at Bear Stearns Building)	15-minute	595	N/A	C/D	505	N/A	C/D
	5-minute	260	N/A	C/D	220	N/A	C/D
47th St. between Madison and Vanderbilt Avenues (north side of 47th Street)	15-minute	720	N/A	C/D	610	N/A	C/D
	5-minute	315	N/A	C/D	265	N/A	C/D
Madison Ave./47th St. (inside Bear Stearns Building)	15-minute	675	N/A	C/D	570	N/A	C/D
	5-minute	295	N/A	C/D	250	N/A	C/D

Table 9C-23
2010 NO ACTION PEDESTRIAN TIME-SPACE ANALYSES LEXINGTON AVENUE SUBWAY (IRT 4, 5, 6) PLATFORMS AT GRAND CENTRAL TERMINAL

Time-Space Zone	Effective Space Available (sq ft)	AM Peak Hour				PM Peak Hour			
		Peak 5 Minutes		*Peak 15 Minutes*		*Peak 5 Minutes*		*Peak 15 Minutes*	
		Number of Passengers Waiting	Level of Service	Number of Passengers Waiting	Level of Service	Number of Passengers Waiting	Level of Service	Number of Passengers Waiting	Level of Service
Northbound IRT Platform									
1	1,115	125	C/D or better	375	C/D or better	200	C/D or better for all zones	600	C/D or better for all zones
2	580	25	C/D or better	75	C/D or better	50		150	
3	865	50	C/D or better	150	C/D or better	125		375	
4	835	125	C/D or better	375	C/D or better	100		300	
5	970	350	C/D - Mid-D	1,050	C/D - Mid-D	200		600	
6	575	75	C/D or better	225	C/D or better	100		300	
7	550	75	C/D or better	225	C/D or better	100		300	
8	2,165	75	C/D or better	225	C/D or better	425		1,275	
Southbound IRT Platform									
1	1,920	225	C/D or better for all zones	675	C/D or better for all zones	300	C/D or better for all zones	900	C/D or better for all zones
2	570	100		300		125		375	
3	610	50		150		75		225	
4	1,050	175		525		100		300	
5	330	75		225		50		150	
6	810	100		300		100		300	
7	770	100		300		125		375	
8	1,155	125		375		200		600	

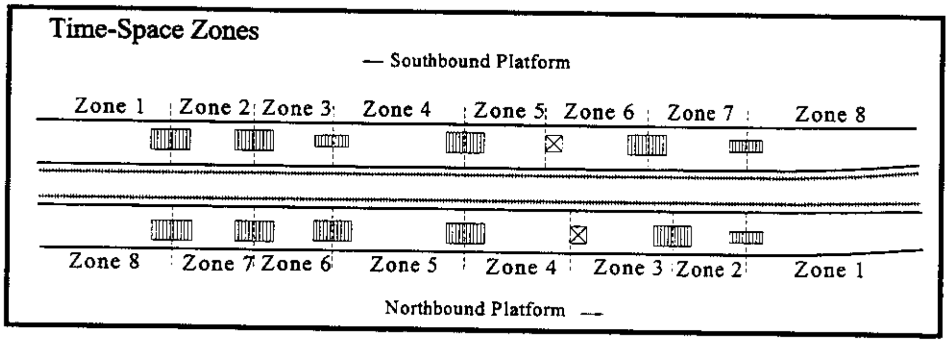


Table 9C-21
2010 NO ACTION SUBWAY STAIR ANALYSES LEXINGTON AVENUE SUBWAY (IRT 4, 5, 6) PLATFORMS AT GRAND CENTRAL TERMINAL

Stairwell Number/ Pedestrian Element	AM Peak Hour				PM Peak Hour			
	Peak 5 Minutes		*Peak 15 Minutes*		*Peak 5 Minutes*		*Peak 15 Minutes*	
	Pedestrian Volume	Level of Service	Pedestrian Volume	Level of Service	Pedestrian Volume	Level of Service	Pedestrian Volume	Level of Service
1 (P12)	595	D	1,535	D	190	A	485	A
2 (P14)	680	F	1,735	E	395	C	1,100	C
3 (P18)	610	E	1,425	D	230	B	625	B
4 (P20)	475	D	1,350	D	225	B	575	B
5 (P22)	395	E	975	D	300	E	795	D
6 (P23)	430	F	1,100	E	455	F	950	D
7 (P21)	325	C	805	B	355	C	895	C
8 (P19)	345	C	915	B	260	B	665	B
9 (P17)	260	B	715	B	390	C	1,010	C
10 (P15)	185	A	485	A	330	C	840	B
11 (P13)	215	B	545	B	400	C	905	B

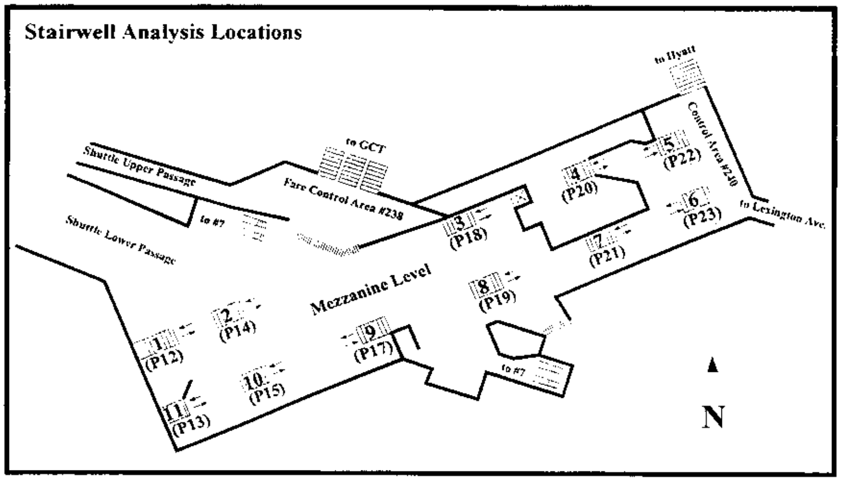

Stairwell Analysis Locations

Table 9C-25
2010 NO ACTION PEDESTRIAN TIME-SPACE ANALYSES
IRT FARE COLLECTION AREA #238 AT 42nd STREET STATION

Time - Space Zone	Effective Space Available (sq ft)	Number of Pedestrians Walking	Level of Service (LOS)
Peak 5 Minutes within Peak AM 15 - Minute Period			
1	730	575	D/E
2	380	685	E/F
Peak AM 15 - Minute Period			
1	730	1,475	D/E
2	380	1,725	D/E
Peak 5 Minutes within Peak PM 15 - Minute Period			
1	730	560	C/D
2	380	520	C/D
Peak PM 15 - Minute Period			
1	730	1,400	C/D
2	380	1,470	C/D

Period (in mins)	Pedestrian Volume	Turnstile Capacity	V / C Ratio
5 (AM)	1,400	2,600	0.54
15 (AM)	3,460	7,800	0.44
5 (PM)	1,175	2,600	0.45
15 (PM)	3,100	7,800	0.40

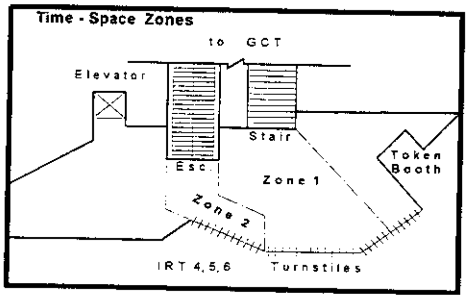
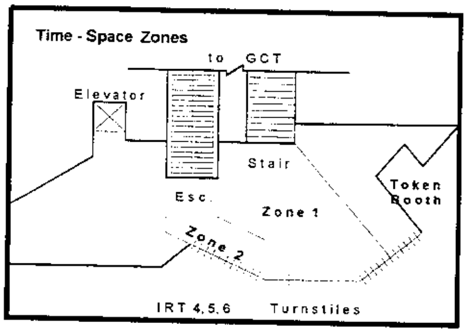


Table 9C-26
2020 NO ACTION PEDESTRIAN TIME-SPACE ANALYSES
IRT FARE COLLECTION AREA #238 AT42nd STREET STATION

Time - Space Zone	Effective Space Available (sq ft)	Number of Pedestrians Walking	Level of Service (LOS)
Peak 5 Minutes within Peak AM 15 - Minute Period			
1	730	625	D/E
2	380	715	E/F
Peak AM 15 - Minute Period			
1	730	1,605	D/E
2	380	1,790	D/E
Peak 5 Minutes within Peak PM 15 - Minute Period			
1	730	590	C/D
2	380	560	D/E
Peak PM 15 - Minute Period			
1	730	1,465	C/D
2	380	1,580	C/D

Analysis Period	Pedestrian Volume	Turnstile Capacity	V / C Ratio
5 (AM)	1,480	2,600	0.57
15 (AM)	3,690	7,800	0.47
5 (PM)	1,245	2,600	0.48
15 (PM)	3,280	7,800	0.42



Tables 9C-23 and 9C-24). Pedestrian conditions within FCA No. 238 will continue to operate with significant congestion (see Tables 9C-25 and 9C-26).

Lexington Avenue Subway Line-Haul Capacity

Under the No Action Alternative, subway service provided by NYCT is expected to increase during peak periods due to signalization improvements on the Lexington Avenue line and the application of platform management techniques at Grand Central station. NYCT will pursue at least the following programs in order to increase line-haul capacity: the "step aside and speed the ride" campaign, which includes etched tiles incorporated into the floor design telling passengers to "step aside" and let on-train passengers out; automated "dwell control announcements," quick response programs for customers who require medical attention while on the subway, platform assistants to expedite loading/unloading, and wider-door cars, and changes in the design of new subway cars (now on order) to ease movement into and out of the cars. Assuming an annual subway ridership growth of 0.5 percent to the year 2010, the express lines will continue to exceed their guideline capacity with a utilization level of 112 percent, while the local line will remain at 61 percent utilization (see Table 9C-27).

Pedestrian Conditions at Street Level

Pedestrian conditions were analyzed for year 2010 using a 0.25 percent per year growth factor, a rate used in other recent Midtown studies. Also, some pedestrian volumes were rerouted to GCN elements (as described above) and, in doing so, will decrease sidewalk and crosswalk volumes and improve operating conditions.

On the east side of GCT along Lexington Avenue between 42nd and 45th Streets, a number of crosswalks and sidewalks that currently operate at- or over-capacity LOS E and F will improve to LOS D or better, since there will be some diversion of MNR commuters to its new GCN facilities. Some specific examples include the south and west crosswalks of the 45th Street/ Lexington Avenue intersection, which will improve to LOS B to D during each of the AM, midday, and PM peak hours. The pedestrian elements closer to 42nd Street, however, will continue to operate poorly, since there will be no GCN diversion experienced at points south of the terminal.

Of the Madison Avenue crosswalks examined between 42nd and 48th Streets, operations at the 43rd Street intersection will show some deterioration during the AM peak period (LOS D, existing; LOS E, No Action) on the east and south crosswalks where no north end diversion will occur. North of 47th Street, where one new GCN element is to be placed, pedestrian conditions will deteriorate, since there will be a new concentration of exiting pedestrians that will have not

Table 9C-28

2010 No Action Corner Reservoir Pedestrian Levels of Service: Grand Central Terminal Study Area

Location	Corner	AM	Midday	PM
Lexington Avenue at 42nd Street	Northwest	D	C	D
Lexington Avenue at 45th Street	Southwest	D	E	D
Madison Avenue at 43rd Street	Northeast	C	C	C
	Southeast	D	C	C
Madison Avenue at 44th Street	Northeast	B	C	C
	Southeast	C	D	C
Madison Avenue at 45th Street	Northeast	D	C	D
	Southeast	B	C	C
Madison Avenue at 46th Street	Northeast	B	B	C
	Southeast	C	C	C
Madison Avenue at 47th Street	Northeast	B	B	C
	Southeast	B	C	C
Madison Avenue at 48th Street	Northeast	C	C	C
	Southeast	B	B	B
Vanderbilt Avenue at 42nd Street	Northeast	C	B	C
Vanderbilt Avenue at 44th Street	Northwest	B	B	B
Vanderbilt Avenue at 45th Street	Northwest	C	D	D
	Southwest	B	C	C
	Southeast	B	C	C
Vanderbilt Avenue at 46th Street	Northeast	B	C	B
	Southeast	B	C	B
	Northwest	B	B	B
	Southwest	B	C	B
Vanderbilt Avenue at 47th Street	Southwest	B	B	B
Park Avenue at 48th Street	Northeast	B	B	B
	Southwest	B	B	B

Table 9C-24
2020 NO ACTION PEDESTRIAN TIME-SPACE ANALYSES LEXINGTON AVENUE SUBWAY (IRT 4, 5, 6) PLATFORMS AT GRAND CENTRAL TERMINAL

		AM Peak Hour				PM Peak Hour			
		Peak 5 Minutes		*Peak 15 Minutes*		*Peak 5 Minutes*		*Peak 15 Minutes*	
Time-Space Zone	Effective Space Available (sq ft)	Number of Passengers Waiting	Level of Service	Number of Passengers Waiting	Level of Service	Number of Passengers Waiting	Level of Service	Number of Passengers Waiting	Level of Service
Northbound IRT Platform									
1	1,115	150	C/D or better	450	C/D or better	225	C/D or better for all zones	675	C/D or better for all zones
2	580	25	C/D or better	75	C/D or better	50		150	
3	865	50	C/D or better	150	C/D or better	125		375	
4	835	150	C/D or better	450	C/D or better	100		300	
5	970	400	Mid-D	1,200	C/D - Mid-D	225		675	
6	575	100	C/D or better	300	C/D or better	100		300	
7	550	100	C/D or better	300	C/D or better	100		300	
8	2,165	100	C/D or better	300	C/D or better	450		1,275	
Southbound IRT Platform									
1	1,920	275	C/D or better for all zones	825	C/D or better for all zones	300	C/D or better for all zones	900	C/D or better for all zones
2	570	125		375		125		375	
3	610	50		150		75		225	
4	1,050	225		675		100		300	
5	330	100		300		50		150	
6	810	125		375		100		300	
7	770	125		375		125		375	
8	1,155	150		450		225		675	

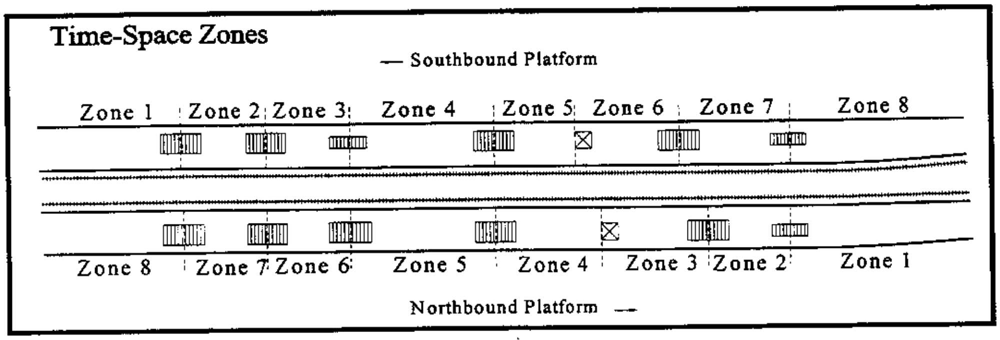


Table 9C-30
2010 No Action Mid-Block Pedestrian Levels of Service: GCT Study Area

Location	Side	Platoon LOS		
		AM	Midday	PM
Lexington Avenue between 43rd and 44th Streets	West	E	D	E
Madison Avenue between 43rd and 44th Streets	East	B	C	C
Madison Avenue between 44th and 45th Streets	East	B	C	C
Madison Avenue between 45th and 46th Streets	East	C	C	C
Madison Avenue between 46th and 47th Streets	East	C	C	C
Madison Avenue between 47th and 48th Streets	East	C	C	D
Vanderbilt Avenue between 45th and 46th Streets	East	B	B	C
	West	B	B	B
Vanderbilt Avenue between 46th and 47th Streets	East	B	B	B
	West	B	B	B
43rd Street between Madison and Vanderbilt Avenues	North	D	C	D
	South	C	C	C
45th Street between Madison and Vanderbilt Avenues	North	C	C	C
	South	C	C	D
46th Street between Madison and Vanderbilt Avenues	North	B	B	B
	South	B	B	B
47th Street between Park and Lexington Avenues	South	B	B	B
47th Street between Vanderbilt and Park Avenues	North	B	B	B
	South	B	B	B
47th Street between Vanderbilt and Madison Avenues	North	B	B	B
	South	B	B	B
48th Street between Park and Lexington Avenues	North	B	B	B
48th Street between Madison and Park Avenues	South	B	B	B

Table 9C-31
No Action Alternative Bus Ridership Levels: GCT Area

Route	AM Peak Hour			PM Peak Hour		
	No. of Buses	Total Riders	Riders/ Bus	No. of Buses	Total Riders	Riders/ Bus
M1	12	610	51	15	790	53
M2	9	535	59	10	610	61
M3	7	410	59	8	455	57
M42	36	2,495	69	15	900	60
M98	8	475	59	6	340	57
M101/102/103	24	1,440	60	23	1,320	57
M104	19	910	48	20	1,020	51
M4	16	910	57	14	795	57
Q32	8	400	50	8	455	57

Source: NYC Transit 1997 Bus Route Profiles.

Table 9C-27

Lexington Avenue Subway Line-Haul Conditions at 42nd Street Grand Central Station (No Action Alternative Year 2010) Downtown (AM Peak)

Subway Lines	Trains/ Hour	Cars/ Hour	Total Guideline Capacity/ Hour (passengers/ hour)	Passengers /Hour	Utilization Rate
Nos. 4 and 5 Express Trains	24	240	26,400	29,488	1.12
No. 6 Local Train	24	240	26,400	16,207	0.61

the three north-south passageways leading out to 42nd Street will function acceptably within LOS C/D conditions. The second set of analyses involved the new GCN vertical circulation elements situated along 47th Street. In this case, these elements were analyzed to include a proposed element into the Bear Stearns (formerly, American Brands) building between Park and Lexington Avenues. All elements will function acceptably within LOS C/D conditions during both 2010 and 2020.

Buses

Bus ridership was assumed to grow annually by 0.75 percent, resulting in bus usage to be about 8.5 percent higher in the 2010 No Action Alternative than for existing conditions. Assuming that existing bus frequencies remain the same in the No Action condition, most bus lines will be operating at or near overcrowded levels (more than 60 passengers per bus), which exceeds NYCT acceptable guidelines during the AM and PM peak hours (see Table 9C-31). With one exception, these bus lines will need an additional bus during the AM and PM peak hours to accommodate the additional peak hour riders. The M42 bus line, which is operating at overcrowded conditions in the existing AM peak hour, will need six additional buses during the AM peak hour to reduce the number of riders per bus from 69 to just under 60 (guideline capacity).

PREFERRED ALTERNATIVE (OPTION 1)

Traffic

The Preferred Alternative would have a series of effects on Midtown traffic. First, it would decrease the general volume of background traffic in the Midtown area. This would be due to the percentage of LIRR commuters who presently drive to work at East Side destinations who would now take LIRR trains to GCT. Secondly, on the other hand, there would be some increase in taxi activity in the GCT area, since some of these new LIRR commuters to GCT would take taxis for the subsequent leg of their work trip. This, however, would be partially offset by current LIRR commuters to Penn Station who currently take taxis to their East Side work destinations, but who would in the future be able to take LIRR trains directly to GCT and then walk to their destinations. This analysis process is explained in more detail below and formed the basis of the LOS analyses of the Preferred Alternative.

The ridership projections developed for the Preferred Alternative were used as the basis for determining the level of trip reduction in the traffic study area around GCT, and it was estimated that the background trip reduction in the GCT area would be 2 percent in the AM and PM peak hours and 0.5 percent in the midday peak hour.

Table 9C-32

Traffic Level of Service Summary Comparison: Preferred Alternative vs. No Action Alternative Conditions

	No Action Peak Hours			Preferred Peak Hours		
	AM	Midday	PM	AM	Midday	PM
Intersections at Overall LOS A/B	28	26	34	27	25	32
Intersections at Overall LOS C	7	15	8	7	12	9
Intersections at Overall LOS D	4	3	2	3	4	2
Intersections at Overall LOS E/F	15	10	10	17	13	11
Intersections with Movements at LOS E or F	22	23	18	22	22	14
Intersections with Significant Traffic Impacts	—	—	—	12	6	8
Intersections with Significant Traffic Benefits	—	—	—	9	2	6

During the AM peak hour, the Preferred Alternative would create significant traffic impacts at 12 intersections, yet would also create significant traffic benefits at 9 other intersections. For the purposes of this assessment, "significant traffic benefits" have been defined as travel delay reductions of 10 seconds or more for traffic movements characterized by LOS D, E, or F under the No Action condition, which parallels the significant traffic impact definition of 10 additional seconds of delay under those LOSs. During the midday peak hour, there would be significant impacts at 6 intersections and significant benefits at 2 intersections, in the PM peak hour, there would be significant impacts at 8 intersections and significant benefits at 6 intersections.

It is important to note that all of the significant impacts generated by the Preferred Alternative can be mitigated via standard traffic engineering improvements, such as signal timing modifications, more restrictive parking regulations, and by providing some vehicular traffic movements with exclusive phases (e.g., left-turn arrows) to minimize conflicts with crossing pedestrians. These are the types of traffic operations improvements that are typically and regularly implemented by the New York City Department of Transportation (NYCDOT) in response to LOS or operational problems throughout the city. None of the significant traffic impacts identified would require costly engineering improvements, such as street widenings, traffic patterns modifications (such as would occur, for example, if turn prohibitions were needed), or reductions of sidewalk space. A discussion of the types of mitigation measures that might be needed to accommodate traffic demands associated with the Preferred Alternative follow.

In the *Times Square area*, there would be significant traffic benefits in both the AM, midday, and PM peak analysis periods as a decrease in taxi traffic en route to Penn Station is expected.

Along *Fifth Avenue*, there would be a significant traffic benefit along westbound 42nd Street at Fifth Avenue in the AM and PM peak analysis periods, also as a result of somewhat reduced taxi traffic en route to Penn Station. There would be no expected significant traffic impacts anywhere along Fifth Avenue between the traffic study limits (i.e., 40th to 48th Streets).

Along *Madison Avenue*, there would be no major differences from No Action traffic conditions. There would be some significant traffic delay reduction benefits along 42nd Street at Madison Avenue in the AM, midday, and PM peak analysis periods, and one significant traffic impact

Table 9C-29

2010 No Action Crosswalk Pedestrian Levels of Service: GCT Study Area

Location	Crosswalk	AM	Midday	PM
Lexington Avenue at 42nd Street	North	E	D	E
	West	E	D	E
Lexington Avenue at 43rd Street	North	E	N/A	N/A
Lexington Avenue at 45th Street	South	C	D	C
	West	C	D	D
Madison Avenue at 43rd Street	North	D	B	C
	East	E	E	D
	South	D	C	C
Madison Avenue at 44th Street	North	C	B	C
	East	C	E	D
	South	C	C	C
Madison Avenue at 45th Street	North	D	C	D
	East	C	D	D
	South	B	C	D
Madison Avenue at 46th Street	North	B	B	B
	East	C	E	E
	South	D	C	B
Madison Avenue at 47th Street	North	D	B	D
	East	C	E	E
	South	C	C	C
Madison Avenue at 48th Street	North	C	C	B
	East	E	E	E
	South	B	B	B
Vanderbilt Avenue at 42nd Street	North	E	E	E
	East	C	B	C
Vanderbilt Avenue at 44th Street	North	D	C	C
	West	C	C	C
Vanderbilt Avenue at 45th Street	North	D	E	D
	East	D	D	C
	South	C	E	E
	West	C	C	C
Vanderbilt Avenue at 46th Street	North	B	C	B
	East	C	D	C
	South	B	D	B
	West	C	C	C
Vanderbilt Avenue at 47th Street	South	C	C	C
	West	C	C	C
Park Avenue at 48th Street	North	B	B	B
	East	D	C	C
	South	B	B	B
	West	C	C	C
Park Avenue at 42nd Street	East	D	C	C
	West	C	C	D

Table 9C-33 (cont.)
PREFERRED ALTERNATIVE TRAFFIC LEVEL OF SERVICE SUMMARIES: GRAND CENTRAL TERMINAL STUDY AREA

	AM Peak Hour			Midday Peak Hour			PM Peak Hour		
INTERSECTION	LOS	Critical Movements with LOS E or F	Signif. Impact/ Benefit	LOS	Critical Movements with LOS E or F	Signif. Impact/ Benefit	LOS	Critical Movements with LOS E or F	Signif. Impact/ Benefit
Park Ave. & 40th St.	C	40th St. EB left/throughs (LOS E)		B	-		F*	40th St. EB (LOS F*)	
Park Ave. & 42nd St.	F*	Park Ave. NB rights & 42nd St. EB (LOS F*)	Impact	F*	Park Ave NB rights & 42nd St. EB (LOS F*)	Impact	F*	Park Ave. NB rights & 42nd St. EB (LOS F*)	Impact
Park Ave. & 46th St.	F*	Park Ave. SB lefts (LOS F*)	Both	F*	Park Ave. SB lefts (LOS F*)		C	-	Benefit
Park Ave. & 47th St.	F*	Park Ave. SB rights (LOS F*)	Impact	B	Park Ave. NB lefts (LOS F)		B	Park Ave. NB lefts (LOS F)	Impact
Park Ave. & 48th St.	F*	Park Ave. SB lefts (LOS F*)	Impact	C	Park Ave. SB lefts (LOS F) & 48th St. EB (LOS E)	Impact	C	Park Ave. SB lefts (LOS F)	Impact
Lexington Ave. & 48th St.	B	-		C	-		B	-	
Lexington Ave. & 47th St.	D	-		D	47th St. WB (LOS E)		B	-	
Lexington Ave. & 46th St.	B	-		D	46th St. EB (LOS E)		B	-	
Lexington Ave. & 45th St.	F*	Lexington Ave. (LOS F*)	Benefit	F*	Lexington Ave. (LOS F*)		C	-	
Lexington Ave. & 44th St.	C	-		F*	Lexington Ave. (LOS F*)		D		
Lexington Ave. & 43rd St.	F*	43rd St. WB (LOS F*)	Impact	F*	43rd St. WB (LOS F*)	Impact	F*	43rd St. WB (LOS F*)	Impact
Lexington Ave. & 42nd St.	F*	All movements (LOS E or F*)	Benefit	D	-		F*	Lexington Ave. SB (LOS E)	
Lexington Ave. & 41st St.	C	-		B	-		B	-	
Lexington Ave. & 40th St.	B	-		B	-		B	-	
Third Ave. & 40th St.	B	-		B	-		B	-	
Third Ave. & 41st St.	F*	41st WB (LOS F*)	Impact	B	-		B	41st WB (LOS F)	Impact
Third Ave. & 42nd St.	F*	42nd St. WB rights (LOS F*)	Impact	F*	Third Ave. NB rights & 42nd St. WB rights (LOS F*)	Impact	F*	42nd St. WB rights (LOS F*)	Impact
Third Ave. & 43rd St.	F*	43rd St. WB (LOS F*)	Impact	B	43rd St. WB (LOS F)	Impact	F*	43rd St. WB (LOS F*)	Impact
Third Ave. & 44th St.	B	-		B	-		B	-	
Third Ave. & 45th St.	B	45th St. WB rights (LOS F)	Impact	B	45th St. WB (LOS F)		B	45th St. WB rights (LOS E)	
Third Ave. & 46th St.	F*	46th St. EB (LOS F*)	Impact	B	-		B	-	
Third Ave. & 47th St.	B	-		F*	47th St. WB (LOS F*)		F*	47th St. WB (LOS F*)	Benefit
Third Ave. & 48th St.	F*	48th St. EB (LOS F*)	Impact	F*	48th St. EB (LOS F*)	Impact	B	-	
Second Ave. & 42nd St.	F*	42nd St. WB (LOS F*)	Benefit	C	-		C	-	
First Ave. & 42nd St.	F*	42nd St. EB lefts (LOS F*)	Benefit	C	42nd St. EB lefts (LOS E)		F*	42nd St. EB lefts (LOS F) & 42nd St. WB rights (LOS F*)	

* indicates unsignalized intersection

(1) One approach has a significant benefit, while another has a significant impact

In terms of new vehicle traffic attracted to the GCT area with the Preferred Alternative in place, the ridership projections indicated that there would be about 330 new vehicle trips in the AM peak hour, 140 vehicle trips in the midday peak hour, and 280 vehicle trips in the PM peak hour. These new trips were assigned to the street network based on the zonal destinations of the new LIRR commuters at GCT, the locations at which taxis are expected to pick up LIRR commuters (including both the long-standing taxi stand and pickup areas along 42nd Street, Vanderbilt Avenue, and Lexington Avenue alongside GCT, as well as new taxi stand areas that would emerge as a result of MNR's new GCN program and new passageways and access/egress points to the street network that are planned as part of the Preferred Alternative), and the most logical routes from the taxi pickup areas to the commuters' destinations.

The traffic analyses also accounted for taxi trips that are currently made by LIRR commuters once they arrive at Penn Station (or, conversely, traveling to Penn Station) by taxi to their East Side destinations. This was done by simulating the routes that taxis currently take from Penn Station to East Side destinations and back to Penn Station either with passengers or deadheading to pick up a fare from Penn Station.

Coupled with the traffic assignments were the increased volume of pedestrian traffic on the street resulting from the influx of LIRR commuters into the GCT area. This is an important consideration, since in some cases the addition of increased pedestrian volumes by itself could be sufficient to significantly affect vehicle traffic LOSs by producing increased conflicts and, thus, reducing capacity.

Overall, the Preferred Alternative's traffic analysis resulted in the following broad conclusions:

- The Preferred Alternative would create significant traffic impacts at some locations where new taxi trips are expected, where substantial volumes of new pedestrian traffic would affect background traffic congestion, or where the combinations of new taxis and new pedestrians would significantly affect LOSs.
- This alternative would reduce taxi volumes and thus reduce traffic congestion at some locations where taxi concentrations en route to or from Penn Station are pronounced, as well as in front and alongside of Penn Station.
- This alternative would also produce an overall modest—2 percent—reduction in Midtown traffic even beyond the immediate GCT and Penn Station areas, which is an important benefit of the project.
- Significant traffic impacts generated by the Preferred Alternative would be mitigatable via standard traffic engineering measures.

These broad conclusions and the analyses on which they emerge are reviewed in the remainder of this section both on an avenue-by-avenue or arterial-by-arterial basis, and in overall study area terms. Details of the LOS analyses are provided in the Technical Appendix.

Table 9C-32 presents an overall comparison of traffic conditions under the Preferred Alternative as compared with the No Action Alternative; details of the analyses are presented in Table 9C-33 (detailed comparisons of the No Action and Preferred Alternatives are included in the Technical Appendix). Overall, there would be a relatively modest increase in the number of intersections characterized by LOS E or F conditions under the Preferred Alternative—an increase of 2 such intersections in the AM peak hour, 3 intersections in the midday peak hour, and 1 in the PM peak hour.

signal timings. The specific mitigations intersection-by-intersection are detailed in the Technical Appendix.

There would also be significant traffic benefits resulting from the project along 42nd Street at *First and Second Avenues*, as a result of reduced crosstown taxi traffic.

The taxi and pedestrian trip assignments made within this impact analysis were intended to replicate projected routings, which is a very complex task given the numerous route alternatives available in Midtown Manhattan. This is particularly true for pedestrians, who often decide to cross a street at one given corner or in one specific crosswalk on conditions prevailing at that moment on that particular day (for example, depending on which green light they get at a particular corner, shopping needs on a particular day, etc.). It is a major challenge to replicate these patterns precisely, even though the impact analyses sought to do so. Yet the overall traffic scenario that emerges is one of significant impacts at some locations that would be readily mitigatable via standard traffic engineering measures, and benefits at other locations due to overall traffic volume reductions.

In addition to the traffic benefits cited above, both areawide within Midtown Manhattan (2 percent general areawide traffic reduction) and at specific East Midtown and 42nd Street intersections where detailed LOS analyses were conducted, there would be other traffic benefits along routes leading to and from Penn Station. That is because much of the taxi traffic attracted to GCT to serve LIRR commuters would no longer be attracted to Penn Station, resulting in traffic volume reductions along several approach routes (such as southbound Seventh Avenue, northbound Sixth Avenue, and westbound 31st, 33rd, and 34th Streets).

Parking

Under the Preferred Alternative, the demand for parking at GCT would not be expected to increase, since LIRR riders would not be parking their personal vehicles near GCT. The level of taxi activity around the terminal would increase and require additional curb space. These taxis would use the existing dedicated stands around GCT, while new stands will likely be needed along curb areas adjacent to the new LIRR GCN elements. The new taxi stands would slightly reduce the available supply of loading/unloading curb space and could therefore slightly increase the prevalence of double parking on the cross streets around GCT. Since, overall, there would probably be six new taxi stands totaling 30 to 40 curbside spaces, the amount of displaced curbside parkers would probably represent a negligible percentage increase of overall curbside parking in the area.

More importantly, the Preferred Alternative would reduce parking demand in Manhattan, since a significant number of auto commuters would take LIRR trains directly to Manhattan's East Side. It is estimated that there would be a reduction in parking demand of approximately 2,800 autos from reduced home-based work trips and additional reductions for non-work trips.

Commuter Rail: Metro-North Railroad

The Preferred Alternative (under both engineering options) would displace a total of 15 MNR tracks in GCT: four platform tracks (114-117), nine storage tracks, and two tracks used for train maintenance. All of the above tracks are currently used for midday storage and maintenance of MNR trains. The Preferred Alternative would also take over use of the lower-level loop track, which is no longer used by MNR.

Table 9C-33
PREFERRED ALTERNATIVE TRAFFIC LEVEL OF SERVICE SUMMARIES: GRAND CENTRAL TERMINAL STUDY AREA

INTERSECTION	AM Peak Hour			Midday Peak Hour			PM Peak Hour		
	LOS	Critical Movements with LOS E or F	Signif. Impact/ Benefit	LOS	Critical Movements with LOS E or F	Signif. Impact/ Benefit	LOS	Critical Movements with LOS E or F	Signif. Impact/ Benefit
Seventh Ave. & 42nd St.	C		Benefit	C	-		C	-	
Broadway & 42nd St.	D	42nd St. WB lefts (LOS F) & throughs (LOS E)	Benefit	F*	42nd St. WB (LOS F*)	Benefit	F*	42nd St. WB (LOS F*)	Benefit
Sixth Ave. & 42nd St.	F*	42nd St. WB rights (LOS F*)		F*	42nd St. WB rights (LOS F*)		F*	42nd St. WB rights (LOS F*)	Both (1)
Fifth Ave. & 48th St.	B	-		B	-		C	-	
Fifth Ave. & 47th St.	B	-		B	-		B	-	
Fifth Ave. & 46th St.	B	-		B	-		B	-	
Fifth Ave. & 45th St.	B	-		F*	45th St. WB (LOS F*)		B	-	
Fifth Ave. & 44th St.	B	-		B	-		B	-	
Fifth Ave. & 43rd St.	B	-		F*	43rd St. WB (LOS F*)		B	-	
Fifth Ave. & 42nd St.	C	42nd St. WB (LOS E)	Benefit	D	42nd St. WB (LOS E)		F*	42nd St. WB (LOS F*)	Benefit
Fifth Ave. & 41st St.	B	-		B	-		B	-	
Fifth Ave. & 40th St.	B	-		B	-		B	-	
Madison Ave. & 40th St.	B	-		C	-		B	-	
Madison Ave. & 41st St.	F*	41st St. EB (LOS F*)	Impact	C	-		B	-	
Madison Ave. & 42nd St.	D	42nd St. EB (LOS E)	Benefit	F*	42nd St. EB (LOS F*)	Benefit	C	-	Benefit
Madison Ave. & 43rd St.	B	-		B	-		B	-	
Madison Ave. & 44th St.	B	-		B	-		B	-	
Madison Ave. & 45th St.	B	-		C	45th St. WB (LOS E)		B	-	
Madison Ave. & 46th St.	B	-		C	46th St. WB (LOS E)		B	-	
Madison Ave. & 47th St.	B	-		B	-		B	-	
Madison Ave. & 48th St.	B	-		B	-		B	-	
Vanderbilt Ave. & 47th St.	C	-		C	-		B	-	
Vanderbilt Ave. & 46th St.	B	-		C	-		B	-	
Vanderbilt Ave. & 45th St.	F*	Vanderbilt Ave. NB (LOS F*)		B	-		D	-	
Vanderbilt Ave. & 44th St. *	A-B	-		A-B	-		A-B	-	
Vanderbilt Ave. & 43rd St. *	A-B	-		A-B	-		A-B	-	
Vanderbilt Ave. & 42nd St.	C	-		C	-		C	-	

* indicates unsignalized intersection

(1) One approach has a significant benefit, while another has a significant impact

Table 9C-34
Distribution of AM Peak LIRR Passengers Arriving at GCT in 2020

Access/Egress Link	6-10 AM Peak Period Arrivals	8-9 AM Peak Hour Arrivals
IRT 4/5/6 Southbound	5,240	2,311
IRT 4/5/6 Northbound	2,194	968
IRT 7 Eastbound	4	2
IRT 7 Westbound	23	10
IRT Shuttle	0	0
42nd Street (East Side +)	12,467	5,498
42nd Street (West Side +)	2,842	1,253
45th Street (West Side)*	14,499	6,394
47th Street (East Side)*	5,069	2,235
47th Street (West Side)*	30	13
49th Street (West Side)*	22,617	9,974
Totals	64,985	28,658

Notes:
+ "East" and "West" refer to areas east and west of GCT, respectively.
* Do not enter GCT lower or upper concourses.

Further refinement of these broad area assignments was made to a smaller zonal basis in the ridership modeling effort discussed earlier. For this project, about 35 zones were established around GCT to which LIRR riders would either walk to, or ride a bus or taxi to. Since the zones themselves are still somewhat large, being composed of several blocks long by one or two avenues wide, it is possible that more than one GCN or other GCT exit could be used to travel to them. Thus, to assign LIRR riders to their final Midtown destination, exiting LIRR patrons were assumed to use one or more of the nearest exits closest to their end assignment zone. That is, people were assumed to ride commuter trains so as to exit that train as close as possible to either a GCN escalator/stairwell or into and through GCT, which in turn would be closest to their work location. (Since GCN has opened, this is occurring on MNR trains, with less crowding into the front cars of trains and more evenly distributed train loadings.) Once on the street, people were assumed to follow as direct a path as possible into that destination zone.

The assignment of pedestrians into and through GCT did not assume a "perfect balancing" in how people would use the future terminal, which would result in a somewhat unrealistic spreading of pedestrian usage. Rather, the assignment assumption maintained the existing pedestrian patterns through GCT. That is, people would use the terminal much in the same manner as they do today with only some slight deviations, which is a conservative approach that tends to predict greater impacts, but which is the typical analysis procedure for an EIS.

Two steps were taken to establish walk patterns in the terminal and then assign LIRR riders destined to points south of GCT. First, on a broad scale, the manner of how GCT is used today was observed during peak commuter periods. This helped identify, for example, that many people cut across the main concourse diagonally, that pedestrian flows along the ticket window wall are along eastbound 41st Street in the AM peak hour. This one significant impact could be mitigated by daylighting (i.e., prohibiting parking) along the north side of the 41st Street approach to the intersection to add an eastbound left-turn lane and by providing a protected signal phase for the eastbound left turns (i.e., not allowing pedestrians to cross this section of Madison Avenue during the phase that eastbound 41st Street left turns receive an "exclusive" green signal phase).

There would be no significant traffic impacts nor benefits anticipated for the *Vanderbilt Avenue* intersections. This entry/exit point to GCT is not expected to be significantly used by LIRR commuters or taxis attracted to it as a result of the Preferred Alternative.

Significant traffic impact locations would occur on *Park Avenue* at 42nd, 46th, 47th, and 48th Streets during various peak traffic hours. Each of these traffic impacts is primarily attributable to the increased volume of pedestrians emerging from GCT with the East Side Access Project in place, rather than from increased taxi traffic itself. That is because increased pedestrian traffic would increase conflicts with vehicular traffic that needs to make left or right turns at these intersections, thereby affecting vehicular traffic LOSs.

At Park Avenue and 42nd Street, it would be necessary to prohibit parking along the northbound Park Avenue approach to the intersection and create two right-turn lanes along with the one left-turn lane, to provide a protected signal phase for northbound Park Avenue traffic to reduce conflicts with pedestrian crossings at this locations, and to shift a modest amount of green signal time (2 seconds) from the northbound phase to the east/west phase (signal timing changes would be for the midday and PM peak periods only). This would provide the required amount of capacity to mitigate significant impacts.

At Park Avenue's intersections with 46th, 47th, and 48th Streets, a series of mitigation improvements would be needed, varying by intersection and by time period. For example, at Park Avenue and 46th Street, in the AM peak period, it would be necessary to remove parking along the southbound Park Avenue approach to provide two left-turn lanes and two through traffic lanes. In the midday peak period, it would be necessary to provide a protected north/south signal phase and to daylight the south curb of the eastbound 46th Street approach to the intersection. In the PM peak period, there would be no significant impacts, so mitigation would not be needed.

At Park Avenue and 47th Street, it would be necessary to provide a protected north/south phase in the AM and PM peak periods, but mitigation would not be needed at midday. At Park Avenue and 48th Street, it would be necessary to daylight the south curb of the eastbound 48th Street approach and to provide a protected north/south phase in the AM and PM peaks, with no impacts or mitigation needed in the midday period.

Along *Lexington Avenue*, there would, overall, not be major differences in traffic conditions under the Preferred Alternative as compared with the No Action Alternative. There would be one significant traffic impact location during all three analysis periods—at Lexington Avenue and 43rd Street, primarily as a result of additional pedestrian traffic through this intersection generated by the Preferred Alternative. This can be readily mitigated by providing westbound 43rd Street traffic with a protected phase to reduce conflicts with pedestrian traffic.

There would be a series of significant traffic impacts along *Third Avenue* as a result of increased pedestrian volumes generated by the Preferred Alternative. These impacts could be mitigated by one or more of the following measures: daylighting one curb along specific east/west streets and/or providing protected east/west signal phases, and, in some cases, making modest shifts in and at times, not less than 1 foot, since it may not be practicable to disrupt service on an existing stairway.

- For passageways and corridors: For a Build LOS D condition, a required widening of 12 inches or more is considered significant; for a Build LOS E condition, a 6- to 12-inch widenings are considered significant; for LOS F, a 3- to 6-inch widening are considered significant; a widening of less than 3 inches is not considered significant.
- For platforms: Although there are no definitive MTA guidelines for platform impacts, the *CEQR Technical Manual* mentions a deterioration of future No Action conditions from better than LOS C/D to worse than C/D, or for any worsening when already in C/D conditions is considered significant. This is consistent with LOS C/D conditions being sought at other pedestrian elements.
- For turnstiles: Any increase in a turnstile's v/c ratio above 1.00 and above which queuing would occur is considered a significant impact.

One type of element that is not addressed in detail in the *CEQR Technical Manual* or the *NYCT Planning and Design Guidelines* is an escalator and how to assess pedestrian conditions on them. In general, these elements have fixed speeds and processing rates and, therefore, maximum theoretical capacities. Thus, determining significant impacts for an escalator may be reasonably based on the volume of people using it versus the escalator's ability to process the load (i.e., v/c ratio), and whether the pedestrian demand on it is under or over capacity (i.e., a v/c ratio ≤ or > 1.00).

Significant impacts for escalators were determined based on concepts used for other pedestrian processing elements, since no escalator impact thresholds currently exist. For example, impact determination for turnstiles centers on whether capacity is exceeded or not and, if it is exceeded, whether that condition results in significant queuing. Similarly, for subway line-haul impacts, increases in per-car load levels that remain under practical capacity limits are not considered significant, although should the surcharge of new riders cause the capacity to be surpassed, a significant impact would occur. Thus, a significant impact for an escalator was identified when its capacity is exceeded when comparing future No Action with Preferred Alternative demands. A second criterion was considered when the v/c ratio is already greater than 1.00 in the No Action case. In such cases, a significant impact would be realized when v/c ratios increase by 5 percent with the addition of the incremental pedestrian flows to escalators. This is roughly equivalent to a 1-inch widening (associated with stairway LOS F) based on the similar processing rates of a standard 24-inch-wide stair exit lane or of a single 20-inch lane of a dual-lane, 40-inch wide escalator.*

The resulting pedestrian LOSs would deteriorate over those identified for the No Action Alternative unless additional improvements were built as mitigation. The most significant deterioration in LOS would occur on the eastern and western vertical circulation elements leading down

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* A "lane" is generally considered to be a person's shoulder breadth, typically 24 inches accounting for slight body sway and heavy clothing. The processing rate of a standard 24-inch-wide stair exit "lane" is approximately 35 persons per minute per *lane* (i.e., 17 persons per foot per minute multiplied by the 2-foot lane width). The processing rate for a 48-inch (40-inch tread), double-width, dual-lane escalator is about 75 persons per minute as measured at all GCT escalators, or about 37 persons per minute per lane.

To preserve MNR's capacity for storing and maintaining trains through the year 2020, the Preferred Alternative would construct five new storage tracks and expand five existing storage tracks within GCT (in the lower level's East End Yard). Additionally, it would construct new storage tracks and maintenance facilities in Highbridge Yard, in the Bronx. The expansion of the East Yard in GCT's lower level, combined with the construction of additional facilities in Highbridge, would be more than adequate to replace tracks taken for the Preferred Alternative and to provide for MNR's current and future train storage needs. In addition, the construction of new facilities in Highbridge Yard would provide additional storage capability for MNR to accommodate future ridership increases and reduce present daily deadhead mileage of those trainsets stored midday at Croton-Harmon, North White Plains, and Stamford.

Commuter Rail: Amtrak and NJ Transit

The work proposed at Harold Interlocking (see Chapter 2, "Project Alternatives") would segregate Amtrak's Northeast Corridor service from LIRR service in the vicinity of Harold Interlocking, and would have a positive impact on Amtrak's Northeast Corridor service between Boston and New York. By providing a quicker route through Harold Interlocking and allowing Amtrak trains to travel into and out of the East River tunnels at higher speeds (via an upgrade of switches), the improved Harold Interlocking would allow Amtrak to reduce travel time between Boston and New York.

The Preferred Alternative would have no adverse impact on either Amtrak's or NJ Transit's non-revenue use of Sunnyside Yard (i.e., for train storage) or East River tunnels.

Pedestrian Conditions Within GCT

Introducing LIRR service into GCT would significantly affect GCT pedestrian flows and conditions. During the 4-hour AM peak period, about 62,300 new LIRR riders would pass through GCT in 2010, rising to about 65,000 in 2020. About 44 percent (about 28,600) of this new ridership would be concentrated in the 8-9 AM peak hour (27,500 in 2010; 29,000 in 2020). This represents a nearly 75 percent increase in the number of commuters that are projected to enter GCT in these two future years from MNR lines. While this represents a significant increase in pedestrian usage of the terminal, these new riders would be better dispersed with the current GCN and restoration efforts adding to the number of ways people can circulate in and around GCT.

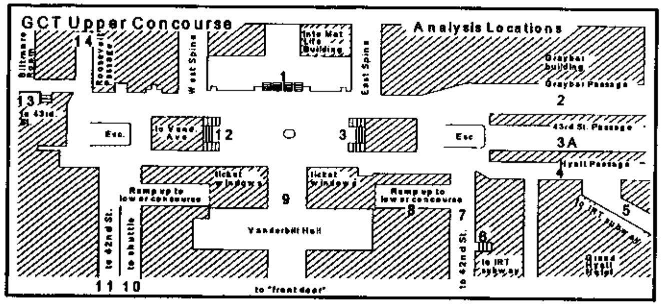
In terms of where these new LIRR riders would circulate through GCT, most would be bound to points north of the terminal and not enter the main terminal concourse. About 42,200 people (65 percent) would be destined to 45th through 49th Streets or above during the 6-10 AM peak period, which is consistent with other GCN projections. Some 15,300 people (23.5 percent) would be oriented to 45th Street or south. The remaining 7,450 (11.5 percent) people would be leaving GCT to use the IRT 4/5/6 subway lines (5,240 to the southbound platform, 2,190 to the northbound platform).

For analysis purposes, 44 percent of these riders were concentrated in the peak hour within this 4-hour peak, which is consistent with findings of previous studies at both Penn Station and at GCT. The projected distribution of LIRR ridership at GCT is shown in Table 9C-34.

Table 9C-35
2010 PREFERRED ALTERNATIVE AM PEAK PERIOD ANALYSIS OF PEDESTRIAN CIRCULATION ELEMENTS WITHIN GRAND CENTRAL TERMINAL

Pedestrian Element		*Peak 5 Minutes within Peak AM 15-Minute Period*		*Peak AM 15-Minute Period*	
Location	**Section**	**Pedestrian Volume**	**LOS**	**Pedestrian Volume**	**LOS**
1. Met Life Building Escalators	3 Up Escalators	1,005	under capacity	2,810	under capacity
	1 Down Escalator	75	under capacity	195	under capacity
2. Graybar Passageway	Corridor	350	A	1,000	A
3. Lexington Ave. Stairs / Escalators	North Stairs from Lower Concourse	155	B	360	A
	South Stairs from Lower Concourse	50	A	125	A
	Up Esc. Facing Hudson News	35	under capacity	90	under capacity
	Down Esc. Facing Hudson News	10	under capacity	30	under capacity
	North Corridor	705	A	1,735	A
	South Corridor	1,040	C	2,960	C
3A. 43rd Street Passageway	Corridor	320	A	875	A
4. Hyatt Passageway	Corridor	545	B	1,490	A
5. Eastern IRT Subway Stairs	Stairs	775	D*	1,985	C
6. Western IRT Subway Stairs / Escalators	Stairs	650	F	1,650	E*
	Up Escalator	435	over capacity	985	under capacity
	Down Escalator	360	under capacity	1,075	under capacity
7. East Passageway to 42nd St. (Park-Lex)	Corridor	1,290	B	3,510	B
8. Lower Concourse East Ramp	Ramp	360	A	990	A
9. 42nd St. Main Entrance	Corridor	465	A	1,300	A
10. Shuttle Passageway	Corridor	795	B	1,795	B
11. Ramp to Vanderbilt Ave. / 42nd St. Corner	Ramp	555	C	1,455	B
12. Vanderbilt Ave. Stairs / Escalators	North Stairs from Lower Concourse	395	D*	1,070	D*
	South Stairs from Lower Concourse	30	A	90	A
	Up Esc. Facing NYCT Store	840	over capacity*	2,310	over capacity*
	Down Esc. Facing NYCT Store	25	under capacity	40	under capacity
	North Corridor	810	B	1,985	B
	South Corridor	675	B	1,625	A
13. 43rd St. Stairs in Biltmore Room	Stairs	315	C	860	C
14. Roosevelt Passageway	Corridor	265	B	690	A

* Significant Impacts



lower than other areas as people are aware of lengthy queues at any given time, and that the path taken by non-MNR users connecting the Met Life building escalators to the IRT 4/5/6 subway is heavily used.

Second and more specific, pedestrians were "traced" off the existing far-west platforms in the lower concourse (where LIRR tracks would be situated) to establish walking paths and patterns on the lower and upper concourses and to the Lexington Avenue subway. During these field reconnaissances, all of the new vertical circulation elements constructed during the terminal's restoration were available for use, as were all corridors in GCT itself with the exception of the new 43rd Street passageway to Lexington Avenue. Thus, current walk paths were considered to reasonably represent future conditions, and were the basis of assigning the portion of LIRR riders destined south of the terminal.

Based on these tracings, LIRR riders would primarily use the closest Vanderbilt Avenue escalator that leads to the NYCT Museum Store on the upper concourse (about 60 percent), followed by the Vanderbilt staircase (about 15 percent) and the Oyster Bar east ramp (12 percent). About 8 percent of exiting passengers from Tracks 111-116 would likely make their way along the entire length of lower concourse to a stair leading up to the Graybar passageway. Other vertical circulation elements in GCT's east side would likely be used by small amounts of 1 or 2 percent each. Once on the upper concourse, various paths are available out of the terminal so that no particular pedestrian element would likely be overburdened with the exception of a few particular elements that are congested even today.

Within GCT, the new escalator bank behind the Vanderbilt stairs, situated closely to the LIRR tracks on the terminal's west side, would be the most heavily used vertical circulation element with 2,300 to 2,500 people (LIRR and MNR) coming up in the respective 2010 and 2020 AM peak 15-minute periods, and 2,000 to 2,100 descending it in the PM peak period in 2010 and 2020 analysis years. The heaviest corridor would be the connection between the Oyster Bar east ramp and the western IRT stair/escalator bank, with 3,200 (2010 PM) and 3,850 (2020 AM) pedestrians traversing it during peak 15-minute periods. The two corridors at GCT's southwest corner, one leading up to the 42nd/Vanderbilt corner and a second directed to the subway shuttle fare control area (FCA No. 236), would each be used by 1,400-1,800 pedestrians per AM and PM peak 15-minute periods in 2010, and upwards of 2,000 in the shuttle passage in year 2020. The Met Life buildings escalator bank would continue to be a major pedestrian element, with between 2,500 and 3,200 people using it during the AM and PM peak periods. Most other elements would carry between 1,000 and 2,000 pedestrians during each of the AM and PM peak 15-minute periods. Overall, some elements, predominantly in GCT's west side and to the IRT subway, would become very heavily used—yet still within capacity limits—with the large LIRR "overlay" forecasted for GCT. Other elements would be characterized by only modest increases, such as corridor connections toward Lexington Avenue.

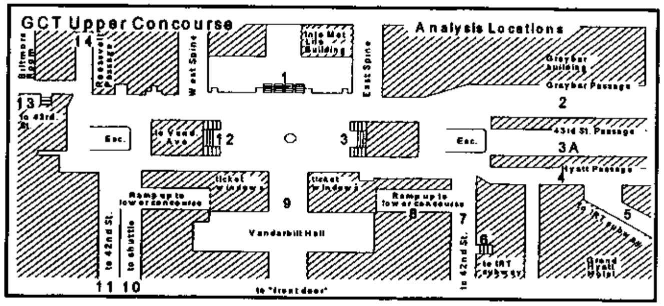
To determine whether these new LIRR pedestrian flows would create significant impacts, LOS criteria cited in the New York City *CEQR Technical Manual* review standards were used as follows:

- For stairways: For a Build LOS D condition, a required widening of 6 inches or more is considered significant; for a Build LOS E condition, a 3- to 6-inch widening is considered significant; for LOS F, a 1- to 3-inch widening is considered significant. As noted in the *CEQR Technical Manual*, the MTA generally does not implement a widening of less than 6 inches,

Table 9C-37
2020 PREFERRED ALTERNATIVE AM PEAK PERIOD ANALYSIS OF PEDESTRIAN CIRCULATION ELEMENTS WITHIN GRAND CENTRAL TERMINAL

Pedestrian Element		*Peak 5 Minutes within Peak AM 15 - Minute Period*		*Peak AM 15 - Minute Period*	
Location	**Section**	**Pedestrian Volume**	**LOS**	**Pedestrian Volume**	**LOS**
1. Met Life Building Escalators	3 Up Escalators	1,085	under capacity	3,030	under capacity
	1 Down Escalator	80	under capacity	195	under capacity
2. Graybar Passageway	Corridor	380	A	1,100	A
3. Lexington Ave. Stairs / Escalators	North Stairs from Lower Concourse	165	B	400	A
	South Stairs from Lower Concourse	55	A	140	A
	Up Esc. Facing Hudson News	40	under capacity	100	under capacity
	Down Esc. Facing Hudson News	10	under capacity	30	under capacity
	North Corridor	770	B	1,880	A
	South Corridor	1,120	C	3,175	C
3A. 43rd Street Passageway	Corridor	345	A	975	A
4. Hyatt Passageway	Corridor	590	B	1,600	B
5. Eastern IRT Subway Stairs	Stairs	830	D	2,130	C
6. Western IRT Subway Stairs / Escalators	Stairs	705	F*	1,755	E*
	Up Escalator	435	over capacity	1,035	near capacity
	Down Escalator	390	over capacity*	1,170	over capacity*
7. East Passageway to 42nd St. (Park-Lex)	Corridor	1,385	C	3,850	B
8. Lower Concourse East Ramp	Ramp	385	A	1,055	A
9. 42nd St. Main Entrance	Corridor	505	A	1,385	A
10. Shuttle Passageway	Corridor	855	C	1,945	B
11. Ramp to Vanderbilt Ave. / 42nd St. Corner	Ramp	610	C	1,575	C
12. Vanderbilt Ave. Stairs / Escalators	North Stairs from Lower Concourse	430	E*	1,190	D*
	South Stairs from Lower Concourse	30	A	100	A
	Up Esc. Facing NYCT Store	895	over capacity*	2,555	over capacity*
	Down Esc. Facing NYCT Store	25	under capacity	45	under capacity
	North Corridor	880	B	2,190	B
	South Corridor	730	B	1,775	B
13. 43rd St. Stairs in Biltmore Room	Stairs	340	D*	935	C
14. Roosevelt Passageway	Corridor	280	B	745	B

* SIGNIFICANT IMPACTS



to the IRT 4/5/6 subway and the escalator bank connecting the lower and upper concourses near the NYCT Museum Store. In each of the AM and PM peak periods for both 5- and 15-minute analysis periods, these elements would experience significant pedestrian impacts with LOSs deteriorating to worse than C/D and, in some instances, well into the E/F range. It is of note that when such congestion occurs on stairs and escalators, there tends to be a metering effect at the downstream locations with a slightly lower arrival rate. Accordingly, the Graybar, new 43rd Street (which would also provide added width out to Lexington Avenue), and Lexington Avenue passageways would operate within generally acceptable LOS C/D or better conditions. All doorways to exterior sidewalks would continue to function at acceptable LOS C/D or better. Tables 9C-35 through 9C-40 list LOS results for the pedestrian flow elements analyzed for the Preferred Alternative within GCT.

On the lower concourse, there would be some queuing at the bottom of the stairs and escalators, although there would appear to be ample room in the waiting area to accommodate such queues. This is not unusual for major commuter rail terminals. On the other hand, the key problem areas would likely occur in the upper concourse areas leading to the IRT stairwells, which could extend back into their connecting passageways and cause some circulation stoppages.

The one significantly impacted element within GCT would be the escalator bank leading to the NYCT Museum Store on the west side of GCT's upper concourse. One mitigation measure for this significant impact would be a redirection of the escalators, which currently do not appear to be servicing the peak direction. Today, one escalator is carried up and another down, with the reverse-peak direction processing about 20 percent of the peak direction flow (less than 50 people during any 15-minute peak period). With the heavy increase of LIRR riders onto this element and a significant overutilization likely to occur in the peak direction, having both escalators operating in the peak direction during peak hours could effectively double the vertical circulation capacity. While v/c ratios would still show over-capacity conditions, the figures would be much closer to 1.00 than if only a single escalator would remain in the peak direction (see Tables 9C-46 and 9C-47, later in this chapter). During off-peak hours and midday periods, these escalators could be operated one up and one down. Other mitigation strategies for the subway elements will be detailed below in the section discussing the Lexington Avenue subway.

Pedestrian Conditions within LIRR Platforms and Crosspassageways

As part of the analyses within GCT, pedestrian flow conditions were also analyzed within LIRR platform and crosspassage elements being designed for the East Side Access Project. The platform composition, that is, locations and sizes of stairwells and platform and crosspassage widths, were established in previous studies based on projected ridership figures, destination studies, and physical and structural constraints. It had previously been determined that ten exits would be needed to adequately process LIRR riders out of the new terminal within acceptable LOS and emergency evacuation-time standards. Each crosspassage under 48th, 45th, and 43rd Streets were designed with at least two exits to prevent "dead-end" conditions. The 47th Street crosspassage, now open with two exits (soon to be three when the Bear Stearns building at 383 Madison Avenue is completed), would have another exit closer to Lexington Avenue, bringing that total to four.

The platforms would have varying widths, ranging from 17 feet (Platforms 4 and 5 to the far west) to almost 23 feet (Platforms 1-3 on the east). Each platform would have stair elements positioned to ensure that walk distances meet National Fire Protection Association criteria. The

Table 9C-39
2010 Preferred Alternative AM and PM Peak Period Volume-to-Capacity Ratios of Key GCT Exit Elements

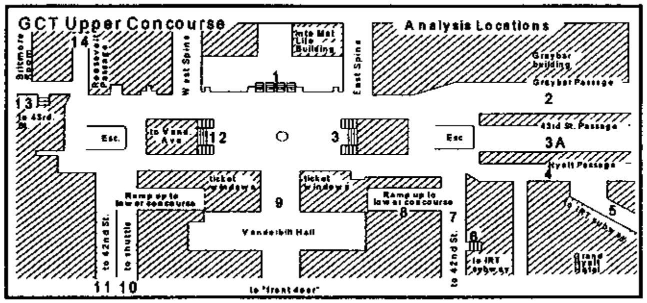
GCT-to-Street Elements	Analysis Period	AM Peak Period Person Trips MNR/ Others	AM Peak Period Person Trips LIRR	AM Peak Period LOS	PM Peak Period Person Trips MNR/ Others	PM Peak Period Person Trips LIRR	PM Peak Period LOS
7 Doors to Vanderbilt Avenue Taxi Stand	15-minute	1,225	80	C/D	1,035	70	C/D
	5-minute	485	30	C/D	375	25	C/D
11 Doors to Vanderbilt Ave./42nd St. Corner	15-minute	910	545	C/D	1,175	460	C/D
	5-minute	370	185	C/D	395	155	C/D
7 Doors to Park Ave./42nd St.	15-minute	940	360	C/D	1,110	305	C/D
	5-minute	345	120	C/D	370	105	C/D
6 Doors to 42nd St. near Hyatt Hotel	15-minute	980	70	C/D	930	60	C/D
	5-minute	350	25	C/D	370	20	C/D
10 Doors to Lexington Ave. from Graybar Passageway	15-minute	1,075	220	C/D	780	190	C/D
	5-minute	375	75	C/D	275	65	C/D
4 Doors to Lexington Ave. from New 43rd Street Passageway	15-minute	755	145	C/D	580	120	C/D
	5-minute	275	50	C/D	210	40	C/D
7 Doors to Lexington Ave. from Hyatt Passageway	15-minute	485	235	C/D	930	200	C/D
	5-minute	185	80	C/D	310	65	C/D
Free Passageway to IRT 4, 5, 6 Fare Control Area #238	15-minute	295	250	C/D	295	215	C/D
	5-minute	140	85	C/D	100	70	C/D
Grand Central North Exits							
48th between Madison and Park Aves.(north side of 48th)	15-minute	N/A	1,015	C/D	N/A	860	C/D
	5-minute	N/A	345	C/D	N/A	290	C/D
48th between Madison and Park Aves. (south side of 48th St.)	15-minute	N/A	660	C/D	N/A	560	C/D
	5-minute	N/A	225	C/D	N/A	190	C/D
NE Corner of Park Ave./ 48th Street (at Westvaco Building)	15-minute	955	815	C/D	815	695	C/D
	5-minute	415	275	E/F	355	235	C/D
47th St. between Park and Lexington Aves. (at Bear Stearns Building)	15-minute	595	275	C/D	505	230	C/D
	5-minute	260	90	C/D	220	80	C/D
47th St. bet. Madison and Vanderbilt Aves. (north side of 47th)	15-minute	720	305	C/D	610	260	C/D
	5-minute	315	105	C/D	265	90	C/D
Madison Ave./ 47th St. (inside Bear Stearns Building)	15-minute	675	245	C/D	570	210	C/D
	5-minute	295	85	C/D	250	70	C/D
Southeast Corner of Vanderbilt Ave. and 45th St.	15-minute	N/A	320	C/D	N/A	270	C/D
	5-minute	N/A	110	C/D	N/A	90	C/D
45th Street between Madison and Vanderbilt Avenues	15-minute	N/A	395	C/D	N/A	335	C/D
	5-minute	N/A	135	C/D	N/A	115	C/D
Escalator from Platform 4/5 into Biltmore Room	15-minute	N/A	525	C/D	N/A	445	C/D
	5-minute	N/A	265	E/F and C/D*	N/A	225	E/F and C/D*
4 Doors in Lower Concourse	15-minute	N/A	1,980	C/D	N/A	1,685	C/D
	5-minute	N/A	670	C/D	N/A	565	C/D

Note: * These figures reflect a 2- and 1-train load condition on Platform 4/5 in 5 minutes.

Table 9C-36
2010 PREFERRED ALTERNATIVE PM PEAK PERIOD ANALYSIS OF PEDESTRIAN CIRCULATION ELEMENTS WITHIN GRAND CENTRAL TERMINAL

Pedestrian Element		*Peak 5 Minutes within Peak PM 15-Minute Period*		*Peak PM 15-Minute Period*	
Location	**Section**	**Pedestrian Volume**	**LOS**	**Pedestrian Volume**	**LOS**
1. Met Life Building Escalators	1 Up Escalator	180	under capacity	480	under capacity
	3 Down Escalators	635	under capacity	1,865	under capacity
2. Graybar Passageway	Corridor	355	A	1,035	A
3. Lexington Ave. Stairs / Escalators	North Stairs from Lower Concourse	120	A	140	A
	South Stairs from Lower Concourse	50	A	305	A
	Up Esc. Facing Hudson News	5	under capacity	20	under capacity
	Down Esc. Facing Hudson News	80	under capacity	210	under capacity
	North Corridor	715	A	1,935	A
	South Corridor	990	C	2,855	C
3A. 43rd Street Passageway	Corridor	250	A	690	A
4. Hyatt Passageway	Corridor	435	A	1,205	A
5. Eastern IRT Subway Stairs	Stairs	710	C	1,830	C
6. Western IRT Subway Stairs / Escalators	Stairs	625	F	1,575	E
	Up Escalator	300	under capacity	845	under capacity
	Down Escalator	310	under capacity	910	under capacity
7. East Passageway to 42nd St. (Park-Lex)	Corridor	1,215	B	3,185	B
8. Lower Concourse East Ramp	Ramp	320	A	895	A
9. 42nd St. Main Entrance	Corridor	515	B	1,415	A
10. Shuttle Passageway	Corridor	720	B	1,875	B
11. Ramp to Vanderbilt Ave. / 42nd St. Corner	Ramp	550	C	1,635	C
12. Vanderbilt Ave. Stairs / Escalators	North Stairs from Lower Concourse	360	D	1,005	D
	South Stairs from Lower Concourse	30	A	65	A
	Up Esc. Facing NYCT Store	5	under capacity	20	under capacity
	Down Esc. Facing NYCT Store	740	over capacity	1,975	over capacity*
	North Corridor	800	B	2,255	B
	South Corridor	605	B	1,735	B
13. 43rd St. Stairs in Biltmore Room	Stairs	255	C	740	C
14. Roosevelt Passageway	Corridor	215	A	640	A

*Significant Impacts



new 45th and 48th Street crosspassages would be 24 feet wide (47th Street's is 22 feet wide), and pedestrians would ascend stairs from the platforms below by one or two* vertical circulation elements. One escalator would be provided on each platform, situated up to the 45th Street crosspassage. In total, each platform would have six egress points.

New street accesses would be created as follows:

- On the south side of 45th Street, midblock between Madison and Vanderbilt Avenues in the 347 Madison Avenue building;
- On the southeast corner of 45th Street/Vanderbilt Avenue corner in the 200 Park Avenue building (Met Life);
- On south side of 48th Street, just west of Park Avenue in the 270 Park Avenue building (Chase Bank);
- On the north side of 48th Street, midblock between Madison and Park Avenues in the 280 Park Avenue building (Banker's Trust); and
- On 47th Street, midblock between Park and Lexington Avenues in the 245 Park Avenue building (Bear Stearns).
- Three entrances constructed in the 47th Street crosspassage as part of the GCN project;
- Direct access to the terminal's lower concourse from the south end of Platforms 1, 2, and 3; and
- Escalators to the Biltmore Room from Platforms 4 and 5.

During AM conditions, the main concern is on clearing platform queues in a reasonable time. Pedestrians were assigned from LIRR trains to platforms and to stair/escalator elements consistent in the percentages of how pedestrians were assigned at the street level. For example, if the two stairwells to the street from the 48th Street crosspassage were projected to be used by about 25 percent of all arriving passengers, then the same percent was assigned to the platform stairs leading to that same crosspassage. Following this, stair/escalator analyses indicate that the elements leading to the 47th and 48th Street crosspassages would each operate at a slightly congested LOS D in the AM peak 15-minute period, while all other elements to the platforms' south end would operate under capacity and at acceptable LOSs (see Table 9C-41).

It was also necessary to assess the clearance times off the platforms, since excessive clearance times could result in undue congestion on the platform itself in the AM peak periods. Stairwell queuing analyses indicated that the north end stair queues would dissipate in 5 or less minutes, while south end elements would need less than 3 minutes to clear. Considering the LIRR would have 10 tracks/5 platforms, it is highly unlikely that their operating plan would allow successive trains to the same platform, and each platform would have at least 5 minutes between arrivals. Thus, excessive platform clearance times would not likely be a major concern considering that calculated clearance times would be under 5 minutes.

During PM conditions, the most important concern is that of platform and crosspassage queuing conditions, and whether there would be enough space for people to wait in. To analyze the

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* Only the 45th Street crosspassage would have two elements, one stair and one escalator. The connections at the southernmost platform end have one vertical circulation element as well as an end-platform doorway into GCT itself.

Table 9C-38
2020 PREFERRED ALTERNATIVE PM PEAK PERIOD ANALYSIS OF PEDESTRIAN CIRCULATION ELEMENTS WITHIN GRAND CENTRAL TERMINAL

Pedestrian Element		***Peak 5 Minutes within Peak PM 15 - Minute Period***		***Peak PM 15 - Minute Period***	
Location	**Section**	**Pedestrian Volume**	**LOS**	**Pedestrian Volume**	**LOS**
1. Met Life Building Escalators	1 Up Escalator	185	under capacity	490	under capacity
	3 Down Escalators	685	under capacity	2,010	under capacity
2. Graybar Passageway	Corridor	395	A	1,385	A
3. Lexington Ave. Stairs / Escalators	North Stairs from Lower Concourse	125	A	140	A
	South Stairs from Lower Concourse	55	A	320	A
	Up Esc. Facing Hudson News	5	under capacity	50	under capacity
	Down Esc. Facing Hudson News	85	under capacity	215	under capacity
	North Corridor	815	B	2,045	A
	South Corridor	1,110	C	3,055	C
3A. 43rd Street Passageway	Corridor	265	A	765	A
4. Hyatt Passageway	Corridor	465	B	1,305	A
5. Eastern IRT Subway Stairs	Stairs	760	D	1,905	C
6. Western IRT Subway Stairs / Escalators	Stairs	660	F*	1,660	E*
	Up Escalator	325	under capacity	920	under capacity
	Down Escalator	325	under capacity	945	under capacity
7. East Passageway to 42nd St. (Park-Lex)	Corridor	1,295	B	3,395	B
8. Lower Concourse East Ramp	Ramp	440	B	935	A
9. 42nd St. Main Entrance	Corridor	545	B	1,505	A
10. Shuttle Passageway	Corridor	770	B	1,940	B
11. Ramp to Vanderbilt Ave. / 42nd St. Corner	Ramp	605	C	1,710	C
12. Vanderbilt Ave. Stairs / Escalators	North Stairs from Lower Concourse	390	D*	1,025	D*
	South Stairs from Lower Concourse	35	A	90	A
	Up Esc. Facing NYCT Store	5	under capacity	20	under capacity
	Down Esc. Facing NYCT Store	780	over capacity*	2,070	over capacity*
	North Corridor	875	B	2,340	B
	South Corridor	655	B	1,885	B
13. 43rd St. Stairs in Biltmore Room	Stairs	275	C	770	C
14. Roosevelt Passageway	Corridor	230	A	665	A

* Significant Impacts

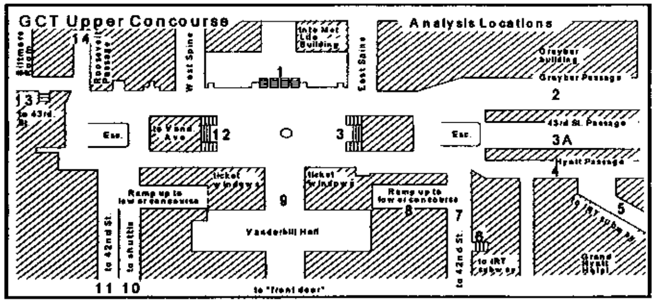


Table 9C-41
PREFERRED ALTERNATIVE AM PEAK PERIOD ANALYSES OF VERTICAL CIRCULATION ELEMENTS
LIRR PLATFORMS 1 - 5 AT GRAND CENTRAL TERMINAL

Pedestrian Element	*2010 Peak 5 Minutes*		*2020 Peak 5 Minutes*	
	Pedestrian Volume	**Level of Service**	**Pedestrian Volume**	**Level of Service**
1. 48th Street Stair	285	D	300	D
2. 47th Street Stair	280	D	295	D
3. 45th Street Escalator	160	under capacity	170	under capacity
4. 45th Street Stair	80	A	85	A
5. 43rd Street Esc. To Biltmore Room (Platform 4 / 5)	135	under capacity	140	under capacity
6. 43rd Street Stair to 43rd Street Underpass (Platform 4 / 5)	115	A	120	A
5. 43rd Street Esc. To Suburban Concourse (Platform. 1 / 2 / 3)	125	under capacity	130	under capacity
6. 43rd Street Stair to Suburban Concourse (Platform 1 / 2 / 3)	60	A	65	A

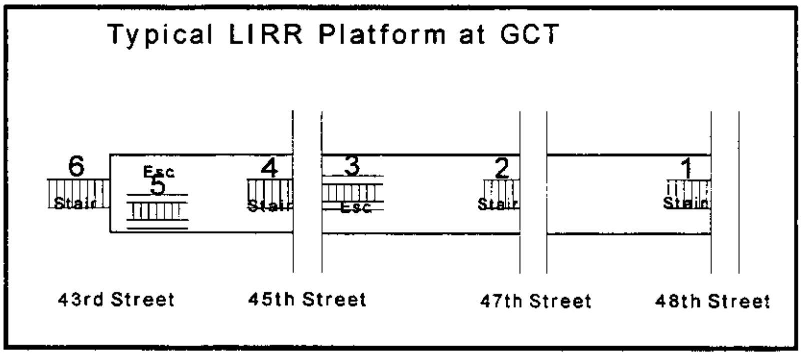


Table 9C-40
2020 Preferred Alternative AM and PM Peak Period Volume-to-Capacity Ratios of Key GCT Exit Elements

		AM Peak Period			PM Peak Period		
		Person Trips			Person Trips		
GCT-to-Street Elements	Analysis Period	MNR/ Others	LIRR	LOS	MNR/ Others	LIRR	LOS
7 Doors to Vanderbilt Avenue Taxi Stand	15-minute	1,335	85	C/D	1,130	75	C/D
	5-minute	530	30	C/D	405	25	C/D
11 Doors to Vanderbilt Ave./42nd St. Corner	15-minute	1,000	575	C/D	1,225	485	C/D
	5-minute	415	195	C/D	440	165	C/D
7 Doors to Park Ave./42nd St.	15-minute	1,005	380	C/D	1,185	320	C/D
	5-minute	375	130	C/D	435	110	C/D
6 Doors to 42nd St. near Hyatt Hotel	15-minute	1,065	75	C/D	1,010	65	C/D
	5-minute	380	25	C/D	400	20	C/D
10 Doors to Lexington Ave. from Graybar Passageway	15-minute	1,180	235	C/D	860	200	C/D
	5-minute	410	80	C/D	305	65	C/D
4 Doors to Lexington Ave. from New 43rd Street Passageway	15-minute	825	150	C/D	635	130	C/D
	5-minute	300	50	C/D	230	45	C/D
7 Doors to Lexington Ave. from Hyatt Passageway	15-minute	530	245	C/D	1,015	210	C/D
	5-minute	195	85	C/D	340	70	C/D
Free Passageway to IRT 4, 5, 6 Fare Control Area #238	15-minute	325	265	C/D	270	225	C/D
	5-minute	155	90	C/D	110	75	C/D
Grand Central North Exits							
48th between Madison and Park Aves.(north side of 48th)	15-minute	N/A	1,070	C/D	N/A	910	C/D
	5-minute	N/A	360	C/D	N/A	305	C/D
48th between Madison and Park Aves. (south side of 48th St.)	15-minute	N/A	695	C/D	N/A	590	C/D
	5-minute	N/A	235	C/D	N/A	200	C/D
NE Corner of Park Ave./ 48th Street (at Westvaco Building)	15-minute	1,060	860	E/F	900	735	C/D
	5-minute	465	290	E/F	395	245	E/F
47th St. between Park and Lexington Aves. (at Bear Stearns Building)	15-minute	660	290	C/D	560	245	C/D
	5-minute	290	100	C/D	245	85	C/D
47th St. bet. Madison and Vanderbilt Aves. (north side of 47th)	15-minute	800	325	C/D	680	275	C/D
	5-minute	350	110	C/D	295	95	C/D
Madison Ave./ 47th St. (inside Bear Stearns Building)	15-minute	745	260	C/D	635	220	C/D
	5-minute	325	90	C/D	275	75	C/D
Southeast Corner of Vanderbilt Ave. and 45th St.	15-minute	N/A	335	C/D	N/A	285	C/D
	5-minute	N/A	115	C/D	N/A	95	C/D
45th Street between Madison and Vanderbilt Avenues	15-minute	N/A	415	C/D	N/A	355	C/D
	5-minute	N/A	140	C/D	N/A	120	C/D
Escalator from Platform 4/5 into Biltmore Room	15-minute	N/A	555	C/D	N/A	470	C/D
	5-minute	N/A	280	E/F and C/D*	N/A	240	E/F and C/D*
4 Doors in Lower Concourse	15-minute	N/A	2,080	C/D	N/A	1,770	C/D
	5-minute	N/A	705	C/D	N/A	595	C/D

Note: * These figures reflect a 2- and 1-train load condition on Platform 4/5 in 5 minutes.

Table 9C-43
Preferred Alternative PM Peak Hour Pedestrian Time-Space Analyses Crosspassageways at GCT

Time/Space Zone	PM Peak Period (minutes)	Effective Space Available (square feet)	Number of Passengers Waiting	Level of Service (LOS)
48th Street Crosspassage (LIRR only)				
1	5	8,400	280	C/D
1	15	8,400	850	C/D
47th Street Crosspassage (LIRR / MNR)				
1 (west end)	5	9,200	430	C/D
2 (east end)	5	8,800	270	C/D
1 (west end)	15	9,200	1,280	C/D
2 (east end)	15	8,800	805	C/D
45th Street Crosspassage (LIRR only)				
1	5	4,400	120	C/D
1	15	4,400	360	C/D

Pedestrian conditions in the initial 15 minutes of delay would vary along the length of the 47th Street crosspassage. In the west end where both LIRR and MNR riders mix, significant congestion and over-capacity conditions would prevail, while in the crosspassage's east end—where MNR passengers would wait—slightly better, near-capacity conditions would occur. For a condition with 30-minute delays, the analyses indicate that conditions within the shared west end of the crosspassage would deteriorate well into over-capacity conditions. With joint use by LIRR and MNR, the threshold of capacity would be reached 15 minutes after the first train delay occurs, as opposed to 40 minutes under the No Action Alternative.

Lexington Avenue Subway Conditions

The analysis of potential impacts at the IRT 42nd Street subway station serving GCT focused on key station elements and line-haul capacity. For the subway station itself, all stairwells connecting the mezzanine level to the Lexington Avenue subway platforms, all north- and southbound platform zones, and Fare Control Area No. 238 connecting the station's turnstiles with the western stair/escalator bank to GCT's upper concourse were analyzed. Also, the eastern stair bank leading to Fare Control Area No. 240 under Lexington Avenue was analyzed.

The Preferred Alternative would significantly affect conditions on some stairwells connecting to critical platform areas. During the AM peak period, about 5,240 new subway riders (2,310 in the 8-9 AM peak hour) would be destined to Lower Manhattan and other points south of GCT, while another 2,195 people (970 in the AM peak hour) would be using the northbound subway lines as part of their trip. Slightly lower (i.e., about 15 percent) pedestrian volumes would occur (although reversed, into GCT) during the PM peak hour.

The first assignment of LIRR riders into the 42nd Street subway station was based on the tracings of how people access the subway station via either the western stair/escalator bank just to the east of the main waiting room in the upper concourse (92 percent) or the eastern stairwell closer to Lexington Avenue (8 percent). It is also possible that the "free" passageway would be used, since the reconstruction of that element in nearing completion, and it is now reopened. The

LIRR-only crosspassages, operations considered 2.5-minute train headways near-full passenger loads for a 12-car train. Analyses of the 47th Street crosspassage would have both LIRR trains and MNR trains. For this case, MNR trains were added with a similar set of ridership figures with a slightly shorter 10-car train. These are actually reasonably worst-case conditions in that many peak-period train consists are shorter and have lower passenger occupancies.

The analysis was conducted for a peak 15-minute period with 2.5-minute departures. During this period, there would be a constant turnover of passengers in the crosspassage, since trains would depart GCT continuously; however, there would likely would be no time when the crosspassage would be completely empty.

Since it is likely that some passengers would wait on the platform and others in the crosspassages, the analyses assumed several scenarios that "assign" people to both platform and crosspassage areas. For example, one analysis case involved having 50 percent of a train's load waiting on the platform and 50 percent in the crosspassage; other cases varied these percentages (e.g., 75 percent on platform/25 percent in crosspassage).

The LIRR-only crosspassages under 45th and 48th Streets were assumed to have one large, homogeneous zone with train departures (and loadings) equally timed from all of their tracks. For the 47th Street crosspassage, however, two time-space zones were assumed, since only the western end would have LIRR and MNR passengers queuing, while the eastern MNR-only end would likely have only MNR riders.

Another analysis parameter concerns the volume of pedestrians that would be waiting at point in a typical 15-minute period. This depends on how people arrive at the terminal itself, although it is likely that this average waiting time is between 5 and 10 minutes (i.e., time to glance at the departure board for track assignments, etc.). Considering this and that a constant turnover of passengers in the crosspassage would occur, since peak-period trains would be departing GCT frequently, only two or four train loads of passengers for each railroad would be waiting at any one point in all crosspassages and GCT waiting areas during the PM peak.

Examining the LIRR platforms, three separate waiting zones would exist between the stairs leading up to the crosspassages. The analysis indicates that, for a single train load of people all waiting on the platform, LOS C/D or better would prevail on all LIRR platforms for the peak 5 and 15 minutes prior to train boarding (see Table 9C-42).

With LIRR passengers likely using a new waiting area in the western sections of the 47th Street crosspassage (which would link the 47th and 48th Street crosspassageways) and the majority of MNR riders (no LIRR riders) using the eastern sections, the analysis indicates that conditions would continue to vary along the length of the crosspassage. The worst condition would occur in the LIRR/MNR zone to the west end: LOS C/D and mid-D conditions would prevail (a time-space utilization of about 80 percent for 5- and 15-minute periods) when people queue in the crosspassage at a train-load rate of 75 percent waiting there. If the crosspassage becomes more crowded, a higher proportion of people will wait on the platform, and then LOS C/D or better would prevail in the crosspassage. In the crosspassage's east end where MNR passengers would wait, LOS C/D or better would occur (a time-space utilization of 70 percent or less) in all scenarios. For the LIRR-only crosspassages along 45th and 48th Streets, LOS C/D would prevail in all passenger-waiting scenarios (see Table 9C-43).

similar deteriorations within unacceptable LOSs would occur. According to NYCT and *CEQR Technical Manual* assessment criteria, these conditions would be considered a significant impact or worsening.

In platform zones that would experience the highest increases in pedestrian flows, LOS deteriorations would, in general, worsen one level or just exceed a threshold into the next level. Platform zones facing stairwells P14 (southbound) and P17/19 (northbound) would be the most congested areas during 5- and 15-minute periods. (On Tables 9C-48 and 9C-49, these are time-space zones 5 [northbound] and 2 [southbound].) Tables 9C-44 through 9C-49 list LOSs for the fare collection area and turnstiles, mezzanine stairs, and IRT platform zones.

Mitigation strategies aimed at NYCT facilities must be considered as a system from the point where people enter the first descending vertical circulation element from GCT to and through FCAs, to stairwells leading to platforms, to along the platform, and finally, onto trains. A critical link in this system-wide approach, is NYCT's effort to decrease dwell times at this station to increase line-haul capacity.

The first step in assessing mitigation in this portion of the station is to examine what pedestrian facilities are now fully open (previously, certain elements were closed due to reconstruction), and whether these elements are being used to their full potential. If not, increasing usage of underutilized areas needs addressing through signing inside GCT, strategic placement of control agents directing pedestrian flows, and installation of additional readily implementable pedestrian elements, such as new turnstile banks.

One key problem today is the intense use of the western stair/escalator bank and the low use of the "free" passage connecting NYCT FCAs Nos. 236 at the shuttle turnstile area entrance and 238 at the Lexington Avenue Nos. 4/5/6 western turnstile bank. The low use of the free passageway may be due to a number of factors, including perceived security issues because of "blind" corners within it, unawareness of its availability on the part of pedestrians, and simple habits of using other existing elements, and the fact that there has been construction in the immediate vicinity for some years.

Potential mitigation and station reconstruction schemes have been discussed with NYCT. In addition to increasing the use of the free passageway, a number of changes can be made at FCA No. 238 that could serve to facilitate movements into the subway paid areas more easily than descending through the overcrowded western stair/escalator bank, including the following measures:

- A new turnstile bank just west of FCA No. 238 would "siphon off" people in the free passageway directly into the IRT's mezzanine area, and relieve use of the western stair/escalator bank. This measure would require a relocation or elimination of an existing news stand.
- A new south-end stairwell (P10) would continue that siphoning-off action from the new turnstiles, and reduce use of the overcrowded stairwell P14, which directly faces the fare control area and draws large pedestrian volumes. This stairwell may require elimination of the southbound platform's south-end control booth.
- A widening of the corridor mouth into space currently occupied within the Pershing Building's basement where the "paid" shuttle corridor leads into the IRT's mezzanine to allow construction of new stair P10.
- The potential restoration of stairwell P16.

Table 9C-42
PREFERRED ALTERNATIVE PEDESTRIAN TIME-SPACE ANALYSES FOR LIRR PLATFORMS 1-5 AT GRAND CENTRAL TERMINAL

Time-Space Zone	Effective Space Available (sq. ft)	Number of Pedestrians Waiting	Level of Service
	5 Minutes within Peak PM Period		
Platforms 1, 2, 3			
1	3,150	130	C/D
2	7,650	315	C/D
3	5,650	235	C/D
Platforms 4, 5			
1	2,300	140	C/D
2	5,550	310	C/D
3	4,150	245	C/D
	15 Minutes within Peak PM Period		
Platforms 1, 2, 3			
1	3,150	130	C/D
2	7,650	315	C/D
3	5,650	235	C/D
Platform 4, 5			
1	2,300	140	C/D
2	5,550	310	C/D
3	4,150	245	C/D

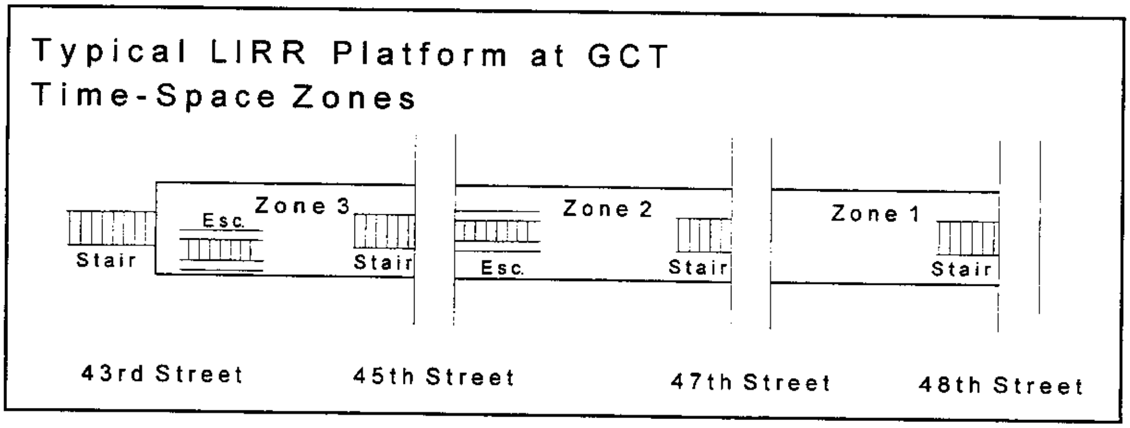
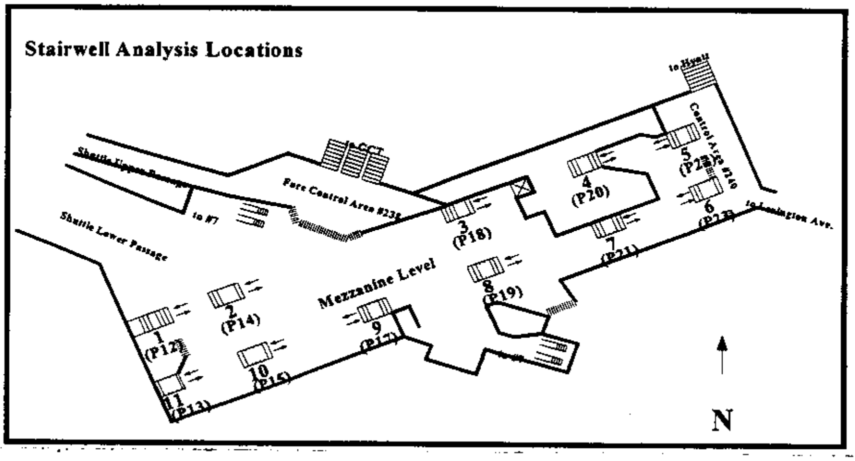


Table 9C-46
2010 PREFERRED ALTERNATIVE SUBWAY STAIR ANALYSES LEXINGTON AVENUE SUBWAY (IRT 4, 5, 6) PLATFORMS AT GRAND CENTRAL TERMINAL

Stairwell Number/ Pedestrian Element	AM Peak Hour				PM Peak Hour			
	Peak 5 Minutes		*Peak 15 Minutes*		*Peak 5 Minutes*		*Peak 15 Minutes*	
	Pedestrian Volume	**Level of Service**	**Pedestrian Volume**	**Level of Service**	**Pedestrian Volume**	**Level of Service**	**Pedestrian Volume**	**Level of Service**
1 (P12)	645	E *	1,680	D *	210	B	540	A
2 (P14)	770	F *	2,010	F *	415	D *	1,155	C
3 (P18)	670	E *	1,580	D *	260	B	715	B
4 (P20)	485	D	1,385	D	230	B	590	B
5 (P22)	405	E	995	E	305	E	805	D
6 (P23)	435	F	1,155	F	495	F	975	D
7 (P21)	330	C	815	B	365	C	920	C
8 (P19)	370	C	985	C	290	B	760	B
9 (P17)	290	B	800	B	440	C	1,155	C
10 (P15)	205	B	550	A	370	C	960	C
11 (P13)	225	B	565	B	450	D	104	C

* SIGNIFICANT IMPACT



analysis assumed that 30 percent of LIRR-to-subway commuters (shifted from the western stair element) would use paths away from the main GCT flows.

The next assignment involved pedestrian flows once into the subway's "paid" area and which stairwells would be used to access the subway platform. Station observations indicated that the subway mezzanine, with a large section of the Hyatt's basement closed off, operates as two distinct areas: one large area with multiple stairwells leading to the south end of the platforms, and a smaller mezzanine area closer to the platforms' north end served by two stairwells. Station tracings indicated that less than 3 percent of all people entering the subway system from FCA Nos. 238 and 240 traverse the entire length of this station's mezzanine, but rather do so at the platform level if they wish to board trains at the far ends of each platform.

As mentioned above, the turnstile bank leading to the southernmost subway platform areas are the most heavily used, since these are closest to the core of the terminal above. In the future with LIRR passengers using this station, pedestrians were assigned based on prevailing uses of each stairwell.

- For the western mezzanine FCA No. 238, there are three and four stairwells serving the respective south- and northbound platforms. Sample counts indicated that about 50 percent of all people entering the subway in this area use the stairwell (P14) directly in front of the turnstiles when traveling downtown. Uptown stairwells are used in a more even manner with about 30-35 percent of the FCA No. 238 pedestrian traffic using the three nearest elements (P15, 17, 19).
- For the eastern mezzanine at FCA No. 240, where two stairwells can be accessed to descend to the south- and northbound platforms, there is another utilization imbalance. For downtown service, the stairwell (P20) facing the turnstiles is used by about two-thirds of all southbound riders, while when traveling uptown, the stairwell (P23) directly adjacent to the turnstile line is used by a similar percentage.

Applying this assignment percentage to the selected subway analysis elements, about 1,050 people in both years 2010 and 2020 would use the center southbound stair (P14) to access the platform during the 8-9 AM peak hour, with another 500 to 600 people using the adjacent stairwells in this same period. For the northbound platform, about 570 people would travel into the center northbound platform area in the same hour using two stairwells (P17/19). Stairwells near FCA No. 240 at the station's north end would be used by between 75 and 125 pedestrians connecting to the southbound platform. In the PM peak when the heaviest flows out of the station emanate from the northbound platform, between 450 and 550 pedestrians would use each of the three southernmost stairwells (P13, 15, 17). From the north end of the northbound platform, just under 100 pedestrians would use the two stairwells to leave the station. Combining these north- and southbound volumes and comparing these with the peak-direction flows (down in the AM, up in the PM), these volumes would represent a 20 to 25 percent increase over the existing peak-direction pedestrian volumes moving through these subway elements.

The analyses of pedestrian conditions within the 42nd Street subway station were conducted for the peak 5-minute and 15-minute pedestrian flow periods. There would be several periods when the stairwells and platforms would deteriorate either further within congested LOS E to F or newly enter these unacceptable levels from the future No Action condition. For example, stairwell P14 would operate at LOS F throughout the 5- and 15-minute AM analysis periods, whereas No Action conditions had this element operating within capacity limits. The same deterioration would occur for each platform's north end stairwells (P22/23). In the PM period,

Table 9C-48
2010 PREFERRED ALTERNATIVE PEDESTRIAN TIME-SPACE ANALYSES LEXINGTON AVENUE SUBWAY (IRT 4, 5, 6) PLATFORMS AT GRAND CENTRAL TERMINAL

		AM Peak Hour				**PM Peak Hour**			
		Peak 5 Minutes		***Peak 15 Minutes***		***Peak 5 Minutes***		***Peak 15 Minutes***	
Time-Space Zone	**Effective Space Available (sq ft)**	**Number of Passengers Waiting**	**Level of Service**	**Number of Passengers Waiting**	**Level of Service**	**Number of Passengers Waiting**	**Level of Service**	**Number of Passengers Waiting**	**Level of Service**
Northbound IRT Platform									
1	1,115	125	C/D or better	375	C/D or better	200	C/D or better	600	C/D or better for all zones
2	580	25	C/D or better	75	C/D or better	50	C/D or better	150	
3	865	50	C/D or better	150	C/D or better	125	C/D or better	375	
4	835	125	C/D or better	375	C/D or better	100	C/D or better	300	
5	970	400	Mid-D	1,200	Mid-D	250	C/D - Mid-D	750	
6	575	75	C/D or better	225	C/D or better	100	C/D or better	300	
7	550	75	C/D or better	225	C/D or better	125	C/D or better	375	
8	2,165	100	C/D or better	300	C/D or better	550	C/D or better	1,650	
Southbound IRT Platform									
1	1,920	275	C/D or better for all zones	825	C/D or better for all zones	350	C/D or better for all zones	1,050	C/D or better for all zones
2	570	125		375		150		450	
3	610	50		150		75		225	
4	1,050	225		675		125		375	
5	330	75		225		50		150	
6	810	100		300		100		300	
7	770	100		300		125		375	
8	1,155	125		375		200		600	

* SIGNIFICANT IMPACT

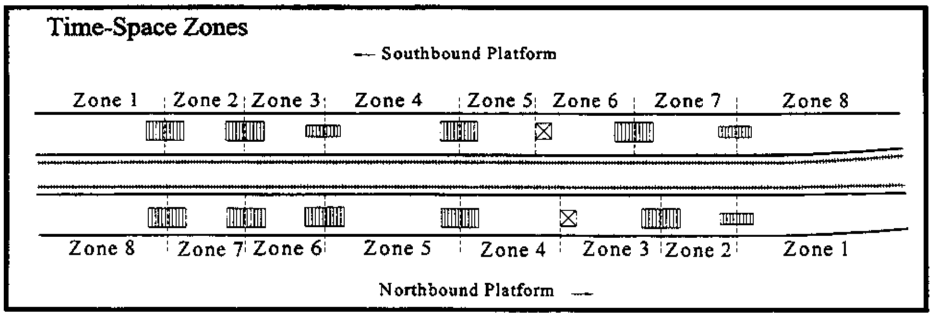


Table 9C-44
2010 PREFERRED ALTERNATIVE PEDESTRIAN TIME-SPACE ANALYSES IRT FARE COLLECTION AREA #238 AT 42nd STREET STATION

Time - Space Zone	Effective Space Available (sq ft)	Number of Pedestrians Walking	Level of Service (LOS)
Peak 5 Minutes within Peak AM 15 - Minute Period			
1	730	645	D/E
2	380	790	E/F
Peak AM 15 - Minute Period			
1	730	1,590	D/E
2	380	1,940	D/E
Peak 5 Minutes within Peak PM 15 - Minute Period			
1	730	625	C/D
2	380	610	D/E*
Peak PM 15 - Minute Period			
1	730	1,575	C/D
2	380	1,755	C/D

*SIGNIFICANT IMPACT

Period (in mins)	Pedestrian Volume	Turnstile Capacity	V / C Ratio
5 (AM)	1,670	2,600	0.64
15 (AM)	4,250	7,800	0.54
5 (PM)	1,400	2,600	0.54
15 (PM)	3,775	7,800	0.48

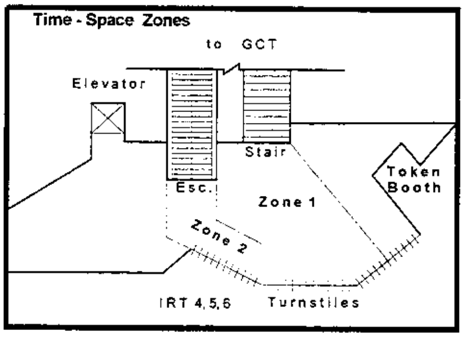
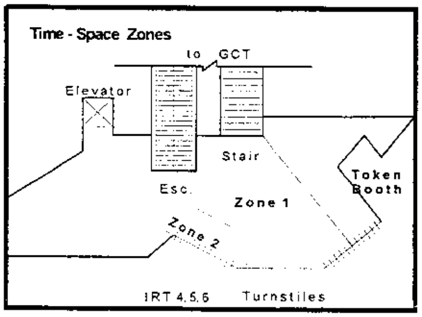


Table 9C-45
2020 PREFERRED ALTERNATIVE PEDESTRIAN TIME-SPACE ANALYSES IRT FARE COLLECTION AREA #238 AT 42nd STREET STATION

Time - Space Zone	Effective Space Available (sq ft)	Number of Pedestrians Walking	Level of Service (LOS)
Peak 5 Minutes within Peak AM 15 - Minute Period			
1	730	705	D/E
2	380	825	E/F
Peak AM 15 - Minute Period			
1	730	1,695	D/E
2	380	2,145	E/F *
Peak 5 Minutes within Peak PM 15 - Minute Period			
1	730	660	C/D
2	380	650	D/E
Peak PM 15 - Minute Period			
1	730	1,660	C/D
2	380	1,865	D/E *

* SIGNIFICANT IMPACT

Period (in mins)	Pedestrian Volume	Turnstile Capacity	V / C Ratio
5 (AM)	1,760	2,600	0.68
15 (AM)	4,520	7,800	0.58
5 (PM)	1,480	2,600	0.57
15 (PM)	3,985	7,800	0.51



- An enlargement of FCA No. 238's "turnstile line" farther east into the IRT's mezzanine would provide additional circulation space in this control area, and help relieve congestion at the escalator's base. The existing large token booth can be repositioned and reduced in size (since automatic fare machines are now in-place) to the north wall to keep it out of the main stream of pedestrian traffic. Currently, there are about 1,200 "usable" or effective square feet available in this area, discounting for column and refuse can footprints, token booth queue area, and unused corner "dead" space. The enlargement of this area can increase the usable space to about 2,000 square feet.

The combination of these potential measures is intended to accomplish a more-balanced use of existing mezzanine stairs leading to the IRT's platforms and a distribution of pedestrian flows into the subway's paid zones. Measures would continue to be investigated through the FEIS to determine their feasibility and efficacy. In addition, NYCT has already begun property acquisition from the Grand Hyatt Hotel for additional mezzanine space once occupied by Modell's Sporting Goods store. Currently, a low percentage of people entering this subway station traverse from the mezzanine's east end to its west end and vice versa. Opening this enclosed mezzanine space would widen the view corridor of entering pedestrians, and likely result in more even stairwell usage.

The above series of station improvements would fully mitigate some significant impacts and partially mitigate others: 1) Impacts at the western bank of escalators/stairwells would be partially mitigated by the diversion of pedestrians to the free passageway and the new stairwell at the south end of the subway platform. Full mitigation would require new, higher capacity escalators or an additional stairwell, which may not be feasible. 2) Impacts at the turnstiles and fare control areas would be fully mitigated. 3) Impacts on three of the stairwells leading from the subway mezzanine level to the subway platforms would be partially mitigated by the overall mitigation plan. 4) An impact on the northbound subway platform within the PM 5-minute peak period would be fully mitigated by the better distribution of pedestrians afforded by the overall plan; conditions during the short-term peak surges that occur as trains load/unload would also be improved. Details of the analyses follow later in this section of the DEIS.

At the platform level as well as in fare control and mezzanine circulation areas, other basic improvement measures are possible, including elimination or shifting of moveable objects on the platform, including refuse containers and benches that are directly in the path of people or occupy too much room on the platform. Refuse containers can be placed against the wall space under stairwells on the platform, while benches can be moved or replaced by the thinner type whose spring-loaded seats rest in the up position when not being used. Should refuse cans remain on the platforms, then a different (rectangular) design, such as those used in MNR stations could be used that fits into corners better than currently used round types, thereby reducing surrounding wasted space. At the mezzanine level, station support columns enclosed in wraparound cladding that reduces circulation space and obscures sight lines could be removed. In addition, NYCT control agents could be positioned at the tops of stairs to control and direct pedestrian movements on the stairs themselves, and at subway car door mouths on the platform.

It is also important to note some congestion at the IRT mezzanine level can be traced to the closure of some passageways at that level and/or due to the dark and, therefore, underutilized passageways. Some pedestrians are probably selecting to use GCT as a link in their path as a substitute. In fact, there are many subsurface passageways that connect to the mezzanine level and completely avoid the main GCT confines. Some are open today, such as the corridors that lead to the Chrysler Building on Lexington Avenue and farther east to Third Avenue directly into the

Table 9C-47
2020 PREFERRED ALTERNATIVE SUBWAY STAIR ANALYSES LEXINGTON AVENUE SUBWAY (IRT 4, 5, 6) PLATFORMS AT GRAND CENTRAL TERMINAL

Stairwell Number/ Pedestrian Element	AM Peak Hour				PM Peak Hour			
	Peak 5 Minutes		*Peak 15 Minutes*		*Peak 5 Minutes*		*Peak 15 Minutes*	
	Pedestrian Volume	Level of Service	Pedestrian Volume	Level of Service	Pedestrian Volume	Level of Service	Pedestrian Volume	Level of Service
1 (P12)	700	E *	1,795	D *	325	B	570	A
2 (P14)	830	F *	2,180	F *	430	D	1,215	D
3 (P18)	715	E *	1,695	D *	285	B	765	B
4 (P20)	530	D	1,485	D	245	B	630	B
5 (P22)	440	F	1,065	E	315	E	845	D
6 (P23)	455	F	1,175	F	505	F	1,060	E
7 (P21)	340	C	855	C	400	D	1,000	C
8 (P19)	395	C	1,055	C	320	C	810	B
9 (P17)	310	B	865	B	460	D *	1,230	C
10 (P15)	220	B	590	A	405	C	1,015	C
11 (P13)	220	B	600	B	480	D *	1,100	C

* SIGNIFICANT IMPACT

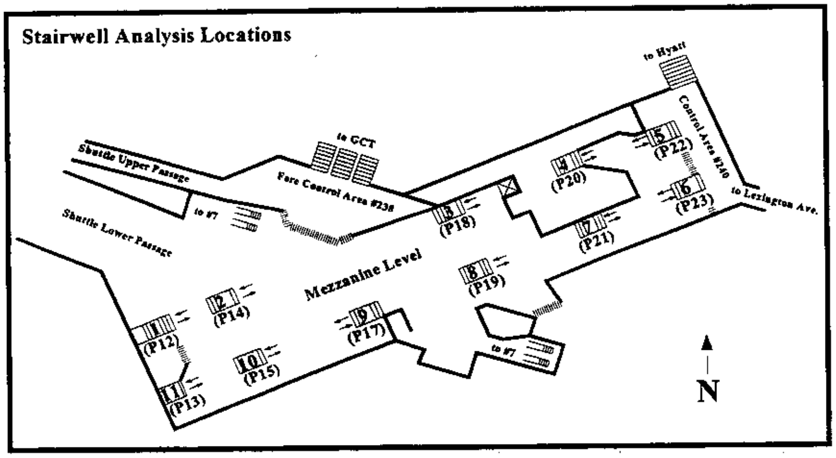


Table 9C-50
2010 MITIGATED PREFERRED ALTERNATIVE AM AND PM PEAK PERIOD ANALYSIS OF PEDESTRIAN CIRCULATION ELEMENTS WITHIN GRAND CENTRAL TERMINAL

Pedestrian Element		*Peak 5 Minutes within Peak AM 15 - Minute Period*			*Peak AM 15 - Minute Period*		
Location	**Section**	**Pedestrian Volume**	**LOS**	**Mitigation Measure**	**Pedestrian Volume**	**LOS**	**Mitigation Measure**
5. Eastern IRT Subway Stairs	Stairs	755	D	Reassigned pedestrian flows into "free" shuttle passageway.	1,925	C	Reassigned pedestrian flows into "free" shuttle passageway.
6. Western IRT Subway Stairs / Escalators	Stairs	605	F*	Reassigned pedestrian flows into "free" shuttle passageway.	1,560	E*	Reassigned pedestrian flows into "free" shuttle passageway.
12. Vanderbilt Ave. Stairs / Escalators	North Stairs from LC	420	D	Although significant impact noted, a more balanced flow and acceptable LOS between north and south stairs will likely result.	1,110	D	Although significant impact noted, a more balanced flow and acceptable LOS between north and south stairs will likely result.
	South Stairs from LC	30	A		90	A	
	Up Escalators	840	over capacity	Direct both escalators up in AM (reassign down flow to nearest stair).	2,310	over capacity	Direct both escalators up in AM (reassign down flow to nearest stair).

Pedestrian Element		*Peak 5 Minutes within Peak PM 15 - Minute Period*			*Peak PM 15 - Minute Period*		
Location	**Section**	**Pedestrian Volume**	**LOS**	**Mitigation Measure**	**Pedestrian Volume**	**LOS**	**Mitigation Measure**
5. Eastern IRT Subway Stairs	Stairs	695	C	Reassigned pedestrian flows into "free" shuttle passageway.	1,780	C	Reassigned pedestrian flows into "free" shuttle passageway.
6. Western IRT Subway Stairs / Escalators	Stairs	585	F*	Reassigned pedestrian flows into "free" shuttle passageway.	1,470	E*	Reassigned pedestrian flows into "free" shuttle passageway.
12. Vanderbilt Ave. Stairs / Escalators	North Stairs from LC	365	D	Although significant impact noted, a more balanced flow and acceptable LOS between north and south stairs will likely result.	1,025	D	Although significant impact noted, a more balanced flow and acceptable LOS between north and south stairs will likely result.
	South Stairs from LC	30	A		65	A	
	Down Escalators	740	under capacity	Direct both escalators down in PM (reassign up flow to nearest stair).	1,975	under capacity	Direct both escalators down in PM (reassign up flow to nearest stair).

*NOT FULLY MITIGATED SIGNIFICANT IMPACT

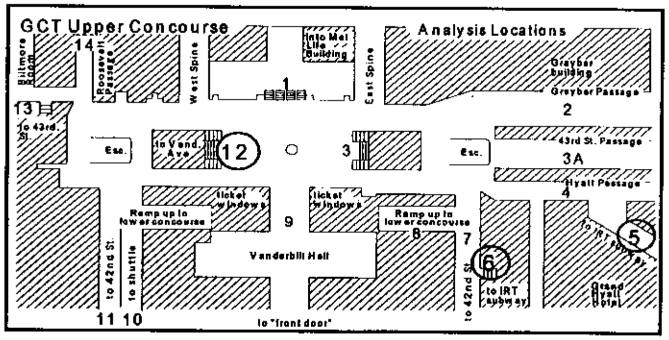


Table 9C-49
2020 PREFERRED ALTERNATIVE PEDESTRIAN TIME-SPACE ANALYSES LEXINGTON AVENUE SUBWAY (IRT 4, 5, 6) PLATFORMS AT GRAND CENTRAL TERMINAL

Time-Space Zone	Effective Space Available (sq ft)	AM Peak Hour				PM Peak Hour			
		Peak 5 Minutes		*Peak 15 Minutes*		*Peak 5 Minutes*		*Peak 15 Minutes*	
		Number of Passengers Waiting	Level of Service	Number of Passengers Waiting	Level of Service	Number of Passengers Waiting	Level of Service	Number of Passengers Waiting	Level of Service
Northbound IRT Platform									
1	1,115	150	C/D or better	450	C/D or better	225	C/D or better	675	C/D or better
2	580	25	C/D or better	75	C/D or better	50	C/D or better	150	C/D or better
3	865	50	C/D or better	150	C/D or better	125	C/D or better	375	C/D or better
4	835	150	C/D or better	450	C/D or better	100	C/D or better	300	C/D or better
5	970	450	Mid-D - D/E	1,350	Mid-D - D/E	300	Mid-D *	900	C/D - Mid-D
6	575	100	C/D or better	300	C/D or better	100	C/D or better	300	C/D or better
7	550	100	C/D or better	300	C/D or better	125	C/D or better	375	C/D or better
8	2,165	100	C/D or better	300	C/D or better	575	C/D or better	1,725	C/D or better
Southbound IRT Platform									
1	1,920	325	C/D or better	975	C/D or better for all zones	350	C/D or better for all zones	1,050	C/D or better for all zones
2	570	150	C/D- Mid-D	450		150		450	
3	610	50	C/D or better	150		75		225	
4	1,050	275	C/D or better	825		125		375	
5	330	100	C/D or better	300		50		150	
6	810	125	C/D or better	375		100		300	
7	770	125	C/D or better	375		125		375	
8	1,155	150	C/D or better	450		225		675	

* SIGNIFICANT IMPACT

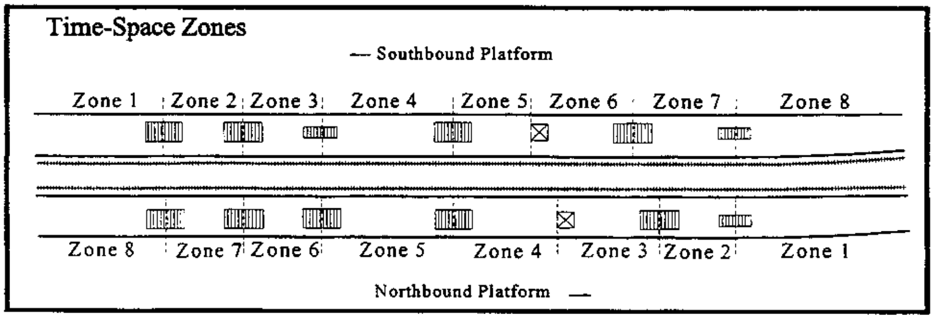


Table 9C-52
2010 MITIGATED PREFERRED ALTERNATIVE PEDESTRIAN TIME-SPACE ANALYSES IRT FARE COLLECTION AREA #238 AT 42nd STREET STATION

Time - Space Zone	Effective Space Available (sq ft)	Number of Pedestrians Walking	Level of Service (LOS)
Peak 5 Minutes within Peak AM 15 - Minute Period			
1	1,500	675	C/D
2	500	830	E/F
Peak AM 15 - Minute Period			
1	1,500	1,680	C/D
2	500	2,055	D/E
Peak 5 Minutes within Peak PM 15 - Minute Period			
1	1,500	655	C/D
2	500	640	C/D
Peak PM 15 - Minute Period			
1	1,500	1,660	C/D
2	500	1,845	C/D

Period (in mins)	Pedestrian Volume	Turnstile Capacity	V / C Ratio
5 (AM)	1,350	2,600	0.52
15 (AM)	3,405	7,800	0.44
5 (PM)	1,150	2,600	0.44
15 (PM)	3,060	7,800	0.39

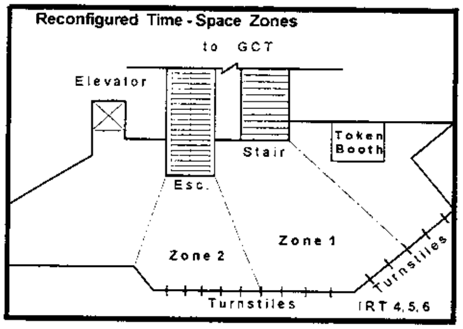
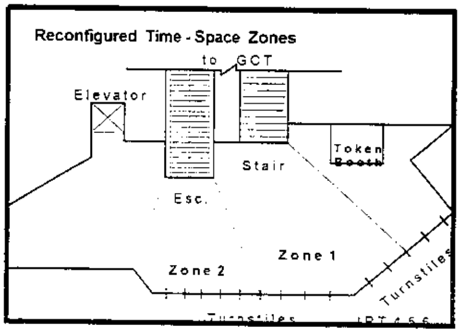


Table 9C-53
2020 MITIGATED PREFERRED ALTERNATIVE PEDESTRIAN TIME-SPACE ANALYSES IRT FARE COLLECTION AREA #238 AT 42nd STREET STATION

Time - Space Zone	Effective Space Available (sq ft)	Number of Pedestrians Walking	Level of Service (LOS)
Peak 5 Minutes within Peak AM 15 - Minute Period			
1	1,500	740	C/D
2	500	860	E/F
Peak AM 15 - Minute Period			
1	1,500	1,790	C/D
2	500	2,265	D/E
Peak 5 Minutes within Peak PM 15 - Minute Period			
1	1,500	690	C/D
2	500	680	C/D
Peak PM 15 - Minute Period			
1	1,500	1,745	C/D
2	500	1,960	C/D

Period (in mins)	Pedestrian Volume	Turnstile Capacity	V / C Ratio
5 (AM)	1,430	2,600	0.55
15 (AM)	3,645	7,800	0.47
5 (PM)	1,220	2,600	0.47
15 (PM)	3,245	7,800	0.42



Kent building. A number of these passages, however, are closed, such as one angling off the Chrysler passageway leading into the Graybar building from NYCT FCA No. 240. Still others, such as two leading to Park Avenue just south of 42nd Street, are open, but involve passing along secluded, dimly lit corners. Opening the passageways that are closed and refurbishing others to provide a more attractive appearance could provide some measure of relief to the IRT mezzanine-level congestion.

The mitigation analyses of the Lexington pedestrian elements used the above-mentioned physical changes as the basis of redistributing pedestrian flows into the station. The analyses assumed that a reconfigured FCA No. 238 and new turnstiles slightly west to siphon off "free passageway" walkers would attract 75 percent of new LIRR-to-subway commuters, with the remaining 25 percent split between the western stair/escalator bank (22 percent) and eastern stair bank (3 percent) proportionally as they are currently used. Measures to accomplish this include wayfinding signage, siphoning, and customer campaigns to encourage use of this newly renovated passage. Tables 9C-50 and 9C-51 list results of the stairwell analyses of the eastern and western vertical circulation elements.

With these new elements, the manner in which the mezzanine would be used would change for both existing MNR users and in the manner in which LIRR commuters were projected to flow through the station. A new stairwell (P10) placed on the southbound platform's southernmost end was assumed to attract 80 percent of the pedestrian flow from the "paid" shuttle passageway, with the remaining 20 percent using the next stairwell (P12) just north. This redistribution away from a heavy use of P12 would present commuters entering the new turnstile bank with a direct (and fairly under used by other subway flows) path to P12; thus, 75 percent of these new turnstile movements were assigned to it. Further, with a shift of pedestrian flows away from the core of FCA No. 238, stairwell P14 would process less pedestrian flows and operate less congested.

Resulting levels of service on stairwells would be returned to year 2010 and 2020 future No Action levels, albeit still within unacceptable levels E and F. Conditions would be more congested during the short-term periods within the 5- and 15-minute peaks. For all stairwells serving the southbound platform, which would operate at LOS D or worse in all study periods, the new redistribution would limit extreme congestion to the 5-minute period, and allow lower congestion levels below capacity limits to prevail in the peak 15-minute period.

All platform zones would operate within LOSs calculated for the No Action conditions in the 5- and 15-minute analysis periods, although again, some of these conditions would still be characterized as unacceptable. Tables 9C-52 through 9C-57 list LOSs for the fare collection area and turnstiles, mezzanine stairs, and IRT platform zones.

Lexington Avenue Subway Conditions—Line Haul Capacity

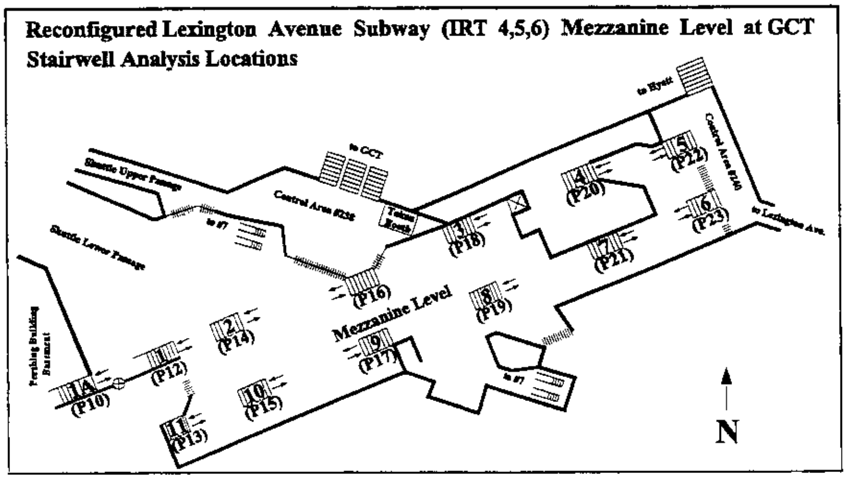
The addition of LIRR commuters onto the Lexington Avenue subway line as a result of the Preferred Alternative would significantly impact line-haul conditions on the Nos. 4 and 5 express lines southbound in the AM peak hour (the northbound condition in the PM peak hour was not analyzed, since it is not as critical as southbound in the AM, following the analysis procedure used in NYCT's MESA MIS/DEIS).

Table 9C-55
2020 MITIGATED PREFERRED ALTERNATIVE SUBWAY STAIR ANALYSES LEXINGTON AVENUE SUBWAY (IRT 4, 5, 6) PLATFORMS AT GRAND CENTRAL TERMINAL

Stairwell Number/ Pedestrian Element	AM Peak Hour				PM Peak Hour			
	Peak 5 Minutes		*Peak 15 Minutes*		*Peak 5 Minutes*		*Peak 15 Minutes*	
	Pedestrian Volume	**Level of Service**	**Pedestrian Volume**	**Level of Service**	**Pedestrian Volume**	**Level of Service**	**Pedestrian Volume**	**Level of Service**
1A (P10)	160	A	465	A	80	A	240	A
1 (P12)	670	E *	1,725	D	210	B	520	A
2 (P14)	760	F *	1,955	E *	405	D	1,135	C
3 (P18)	660	E	1,550	D	250	B	675	B
4 (P20)	530	D	1,485	D	245	B	630	B
5 (P22)	440	F	1,065	E	315	E	845	D
6 (P23)	455	F	1,175	F	505	F	1,060	E
7 (P21)	340	C	855	C	400	D	1,000	C
8 (P19)	395	C	1,055	C	320	C	810	B
9 (P17)	310	B	865	B	460	D *	1,230	C
10 (P15)	220	B	590	A	405	C	1,015	C
11 (P13)	220	B	600	B	480	D *	1,100	C

* NOT FULLY MITIGATED SIGNIFICANT IMPACT

NOTE: The mitigation analysis did not include the potential restoration of stairway P16. Analysis of this element will be performed in conjunction with the evaluation of other measures developed between DEIS and FEIS.



Reconfigured Lexington Avenue Subway (IRT 4,5,6) Mezzanine Level at GCT Stairwell Analysis Locations

Table 9C-51
2020 MITIGATED PREFERRED ALTERNATIVE AM AND PM PEAK PERIOD ANALYSIS OF PEDESTRIAN CIRCULATION ELEMENTS WITHIN GRAND CENTRAL TERMINAL

Pedestrian Element		*Peak 5 Minutes within Peak AM 15-Minute Period*			*Peak AM 15-Minute Period*		
Location	**Section**	**Pedestrian Volume**	**LOS**	**Mitigation Measure**	**Pedestrian Volume**	**LOS**	**Mitigation Measure**
5. Eastern IRT Subway Stairs	Stairs	810	D	Reassigned pedestrian flows into "free" shuttle passageway.	2,065	C	Reassigned pedestrian flows into "free" shuttle passageway.
6. Western IRT Subway Stairs / Escalators	Stairs	655	F*	Reassigned pedestrian flows into "free" shuttle passageway.	1,700	E*	Reassigned pedestrian flows into "free" shuttle passageway.
12. Vanderbilt Ave. Stairs / Escalators	North Stairs from LC	455	E	Although significant impact noted, a more balanced flow and acceptable LOS between north and south stairs will likely result.	1,235	D	Although significant impact noted, a more balanced flow and acceptable LOS between north and south stairs will likely result.
	South Stairs from LC	30	A		100	A	
	Up Escalators	895	over capacity	Direct both escalators up in AM (reassign down flow to nearest stair).	2,555	over capacity	Direct both escalators up in AM (reassign down flow to nearest stair).
13. 43rd St. Stairs in Biltmore Room	Stairs	340	D	Direct both escalators up in AM (reassign down flow to nearest stair).	—	—	—

Pedestrian Element		*Peak 5 Minutes within Peak PM 15-Minute Period*			*Peak PM 15-Minute Period*		
Location	**Section**	**Pedestrian Volume**	**LOS**	**Mitigation Measure**	**Pedestrian Volume**	**LOS**	**Mitigation Measure**
5. Eastern IRT Subway Stairs	Stairs	745	D	Reassigned pedestrian flows into "free" shuttle passageway.	1,850	C	Reassigned pedestrian flows into "free" shuttle passageway.
6. Western IRT Subway Stairs / Escalators	Stairs	615	F*	Reassigned pedestrian flows into "free" shuttle passageway.	1,540	E*	Reassigned pedestrian flows into "free" shuttle passageway.
12. Vanderbilt Ave. Stairs / Escalators	North Stairs from LC	395	D	Although significant impact noted, a more balanced flow and acceptable LOS between north and south stairs will likely result.	1,045	D	Although significant impact noted, a more balanced flow and acceptable LOS between north and south stairs will likely result.
	South Stairs from LC	35	A		90	A	
	Down Escalators	780	over capacity	Direct both escalators down in PM (reassign up flow to nearest stair).	2,070	under capacity	Direct both escalators down in PM (reassign up flow to nearest stair).

*NOT FULLY MITIGATED SIGNIFICANT IMPACT

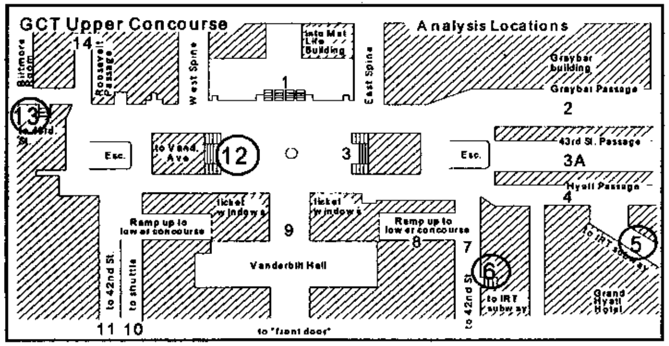


Table 9C-57
2020 MITIGATED PREFERRED ALTERNATIVE PEDESTRIAN TIME-SPACE ANALYSES LEXINGTON AVENUE SUBWAY (IRT 4, 5, 6) PLATFORMS AT GRAND CENTRAL TERMINAL

Time-Space Zone	Effective Space Available (sq ft)	AM Peak Hour				PM Peak Hour			
		Peak 5 Minutes		Peak 15 Minutes		Peak 5 Minutes		Peak 15 Minutes	
		Number of Passengers Waiting	Level of Service	Number of Passengers Waiting	Level of Service	Number of Passengers Waiting	Level of Service	Number of Passengers Waiting	Level of Service
Northbound IRT Platform									
1	1,115	175	C/D or better	525	C/D or better	250	C/D or better	825	C/D or better
2	580	25	C/D or better	75	C/D or better	50	C/D or better	150	C/D or better
3	865	50	C/D or better	150	C/D or better	100	C/D or better	300	C/D or better
4	835	150	C/D or better	450	C/D or better	100	C/D or better	300	C/D or better
5	970	450	Mid-D - D/E	1,350	Mid-D - D/E	300	Mid-D *	900	C/D - Mid D
6	575	100	C/D or better	300	C/D or better	100	C/D or better	300	C/D or better
7	550	100	C/D or better	300	C/D or better	125	C/D or better	375	C/D or better
8	2,165	100	C/D or better	300	C/D or better	575	C/D or better	1,725	C/D or better
Southbound IRT Platform									
1	2,820	375	C/D or better for all zones	1,200	C/D or better for all zones	450	C/D or better for all zones	1,425	C/D or better for all zones
2	570	125		375		150		450	
3	610	50		150		75		225	
4	1,050	250		750		100		300	
5	330	100		300		50		150	
6	810	100		300		100		225	
7	770	125		375		125		375	
8	1,155	175		525		250		750	

* NOT FULLY MITIGATED SIGNIFICANT IMPACT

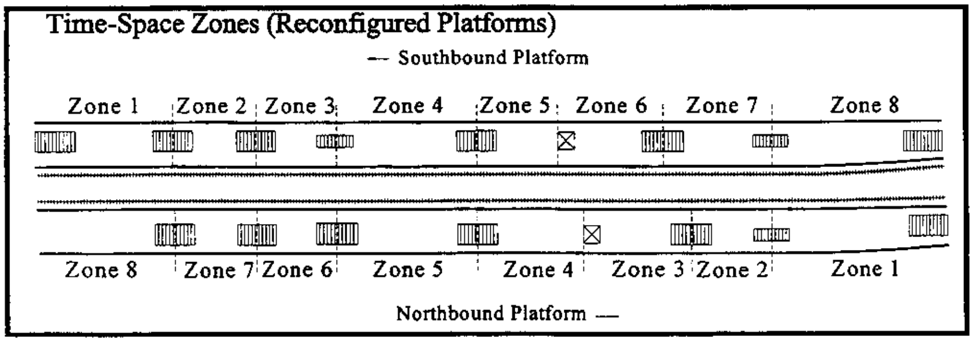


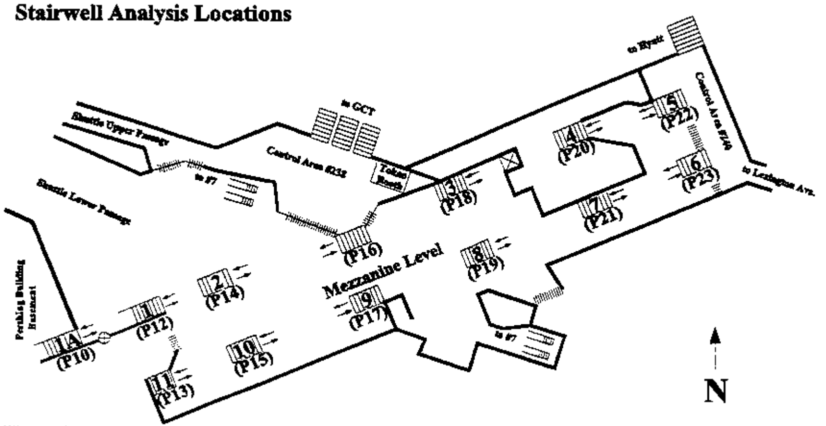
Table 9C-54
2010 MITIGATED PREFERRED ALTERNATIVE SUBWAY STAIR ANALYSES LEXINGTON AVENUE SUBWAY (IRT 4, 5, 6) PLATFORMS AT GRAND CENTRAL TERMINAL

Stairwell Number/ Pedestrian Element	AM Peak Hour				PM Peak Hour			
	Peak 5 Minutes		*Peak 15 Minutes*		*Peak 5 Minutes*		*Peak 15 Minutes*	
	Pedestrian Volume	Level of Service	Pedestrian Volume	Level of Service	Pedestrian Volume	Level of Service	Pedestrian Volume	Level of Service
1A (P10)	155	A	455	A	75	A	225	A
1 (P12)	615	E *	1,615	D *	195	A	495	A
2 (P14)	705	F *	1,795	E *	390	C	1,075	C
3 (P18)	615	E	1,440	D	230	B	630	B
4 (P20)	485	D	1,385	D	230	B	590	A
5 (P22)	405	E	995	E	305	E	805	D
6 (P23)	435	F	1,155	F	445	F	975	D
7 (P21)	330	C	815	B	365	C	920	C
8 (P19)	370	C	985	C	290	B	760	B
9 (P17)	290	B	800	B	440	C	1,155	C
10 (P15)	205	B	550	A	370	C	960	C
11 (P13)	225	B	565	B	450	D	1,040	C

* NOT FULLY MITIGATED SIGNIFICANT IMPACT

NOTE: The mitigation analysis did not include the potential restoration of stairway P16. Analysis of this element will be performed in conjunction with the evaluation of other measures developed between DEIS and FEIS.

Reconfigured Lexington Avenue Subway (IRT 4,5,6) Mezzanine Level at GCT Stairwell Analysis Locations



These shifts in ridership will reduce peak hour demand on the Lexington Avenue express subway lines, reducing delays in passenger loading and unloading at major stations (including GCT) and thus increasing train capacity by allowing better train throughput.

Although the Preferred Alternative would create significant impacts on the Lexington Avenue subway line, it would also produce benefits on other subway lines through the diversion of riders from those lines to the Lexington Avenue line. For example, ridership projections developed for the project indicate that ridership on the south- and northbound 1/2/3/9 Seventh Avenue lines through its 34th Street station would decrease by about 1,145 riders and 85 riders, respectively, in the AM peak hour. Since many of these Seventh Avenue subway riders subsequently transfer to the 42nd Street shuttle, there would also be a decrease in load levels on that crosstown line. This is because many LIRR commuters who presently arrive at Penn Station who transfer to the 1/2/3/9 lines and then to the shuttle, would be able to take direct LIRR service into GCT. Ridership on the south- and northbound B/D/F/Q Sixth Avenue lines would decrease by about 120 and 500 riders, respectively. Ridership on the southbound N/R Broadway lines would decrease by about 215 riders.

The Preferred Alternative would substantially reduce demands on the A/C/E subway lines, especially in the northbound (uptown) direction in the AM peak. In year 2010, there would be a reduction of about 6,000 riders on these lines (combined) in the AM peak hour, and about 13,600 fewer riders in the four-hour AM peak period. Southbound A/C/E ridership would decrease by about 200 in the AM peak hour and 500 in the four-hour peak period. Similar, or slightly higher, benefits would occur in 2020. Queuing at stairwells, corridors, token booths, turnstiles, and platforms would all be reduced significantly as a result of the Preferred Alternative.

There would also be benefits to the westbound IRT No. 7 Flushing line in Queens, since more than half of LIRR commuters who presently transfer at the LIRR's Hunterspoint Avenue terminal station and take the Flushing line to East Side destinations would be able to take LIRR trains directly into GCT. Ridership projections indicate that there would be about 1,200 fewer riders on the westbound No. 7 train in the AM peak hour. There would also be ridership reduction benefits at the LIRR's Flatbush Avenue terminal station in Brooklyn, which connects with the Lexington Avenue 4/5/6 lines and currently brings LIRR riders to Lower Manhattan. About 650 riders are projected to divert from the Flatbush Avenue station (and its connecting northbound 4 and 5 lines) to GCT.

Therefore, significant adverse impacts that the Preferred Alternative would have on line-haul, platform, and vertical circulation system elements at the Lexington Avenue line's 42nd Street station would be at least partially offset by congestion-reduction benefits at several other stations and subway lines in the MTA/NYCT system. Similarly, there would be congestion-reduction effects of reduced ridership through Penn Station as well, including its stairwells to the LIRR concourse, concourse corridors, connections to subway lines within the station, and stairwells and escalator connections to the street level.

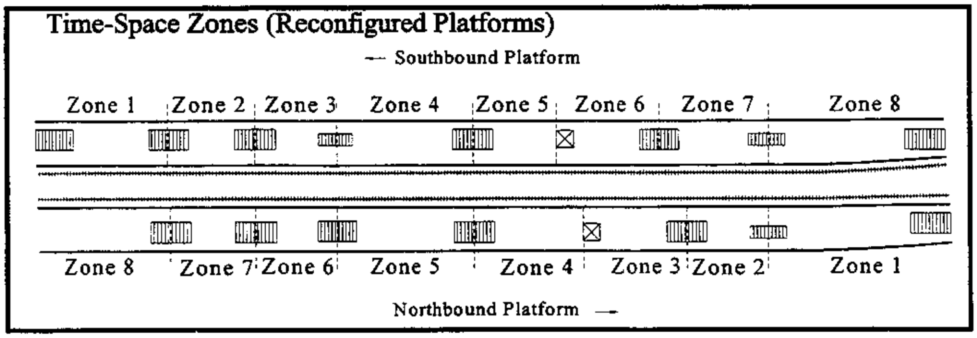
Pedestrian Conditions at Street Level

The analysis of pedestrian impacts included identifying likely pedestrian paths into and out of GCT and along neighboring streets, analyzing future LOSs, including GCN circulation improvements, and identifying mitigation needed to relieve significant impacts.

Table 9C-56
2010 MITIGATED PREFERRED ALTERNATIVE PEDESTRIAN TIME-SPACE ANALYSES LEXINGTON AVENUE SUBWAY (IRT 4, 5, 6) PLATFORMS AT GRAND CENTRAL TERMINAL

Time-Space Zone	Effective Space Available (sq ft)	AM Peak Hour				PM Peak Hour			
		Peak 5 Minutes		*Peak 15 Minutes*		*Peak 5 Minutes*		*Peak 15 Minutes*	
		Number of Passengers Waiting	Level of Service	Number of Passengers Waiting	Level of Service	Number of Passengers Waiting	Level of Service	Number of Passengers Waiting	Level of Service
Northbound IRT Platform									
1	1,115	150	C/D or better	225	C/D or better	225	C/D or better	750	C/D or better for all zones
2	580	25	C/D or better	75	C/D or better	50	C/D or better	150	
3	865	50	C/D or better	150	C/D or better	100	C/D or better	300	
4	835	125	C/D or better	375	C/D or better	100	C/D or better	300	
5	970	400	Mid-D	1,200	Mid-D	250	C/D - Mid-D	750	
6	575	75	C/D or better	225	C/D or better	100	C/D or better	300	
7	550	75	C/D or better	225	C/D or better	125	C/D or better	375	
8	2,165	100	C/D or better	300	C/D or better	550	C/D or better	1,650	
Southbound IRT Platform									
1	2,820	325	C/D or better for all zones	975	C/D or better for all zones	450	C/D or better for all zones	1,350	C/D or better for all zones
2	570	125		300		150		450	
3	610	50		150		75		225	
4	1,050	200		600		100		300	
5	330	75		225		50		150	
6	810	75		225		100		300	
7	770	100		300		125		375	
8	1,155	150		300		200		675	

* NOT FULLY MITIGATED SIGNIFICANT IMPACT


Time-Space Zones (Reconfigured Platforms)

using the east side of Madison Avenue between 48th and 49th Streets near a new LIRR GCN element there.

To determine significant impacts, LOS criteria cited in the New York City *CEQR Technical Manual* were used as follows:

- For crosswalk maximum surge conditions (when the opposing flows meet in the crosswalk) and corner reservoir conditions: Decreases in pedestrian area occupancies of 1 square foot per person under the Build projection when the No Action condition has average occupancies under 15 square feet per person (threshold D/E) are considered significant.
- For sidewalk and other midblock locations: An increase of 2 pedestrians per foot per minute (PFM) over the No Action condition for platoon flow rates greater than 15 PFM (LOS D/E).

It is of note that these criteria do not account for two unique phenomena that occur in Midtown as pedestrians attempt to shorten their travel time. The first is called "checkerboarding." Rather than wait at street corners, platoons of pedestrians tend to continue their walk by using the crosswalk that has the green signal. The result is a path that takes people north for, say a block, then west to the next avenue, then north for another block or so until their final destination is reached. The second pattern occurs when side streets are given green signal time, but do not have a heavy vehicle flow along them. During such cases, pedestrians take advantage of such gaps and cross diagonally across the avenue and never reach the approaching corner. While this is done to reduce their commute, it is also possible that there is some acknowledgment that the corner waiting areas are overcrowded and this is an opportunity to avoid that congestion. This frequently takes place along Madison Avenue during the AM peak hours when northbound traffic flows out of Midtown are low, and there are often times when unused signal time prevails.

The effect of these phenomena is that the LOS computed by the *HCM* and CEQR analysis methodologies may actually be somewhat worse than those occurring at corners in Midtown. Specifically, the methodologies do not account for the checkerboard effect at a corner reservoir and have all the pedestrian flows stopped and queued there. By contrast, actual field reconnaissances showed that much of this queuing does not occur at all. The diagonal midblock crossing movements are not accounted for, since these take place outside of the defined crosswalk lines. While unprotected midblock crossings can be unsafe when midblock traffic signals are not in operation, it does routinely occur and will continue in the GCT area.

The findings of the on-street pedestrian LOS analyses indicate that pedestrian conditions would continue to deteriorate from those under the No Action Alternative (see Tables 9C-59 through 9C-61). There would appear to be a mix of slight congestion (LOS D) to extreme bunching or even stoppages (LOS F). This is not surprising, since some paths into and out of GCT are more "popular" than others. Some specific examples follow.

During the AM peak period, two of the corners of the GCT "superblock" would deteriorate to near- or over-capacity conditions. At the 42nd Street corners at Vanderbilt and Lexington Avenues, LOS E conditions would prevail in the reservoir areas. In the AM and PM peak periods, significant pedestrian impacts would occur at Madison Avenue's 43rd and 48th Street crosswalks and along Lexington Avenue at its 42nd Street crosswalk in the AM. Similar conditions would be experienced during the midday period, with another significant impact at the north crosswalk of 42nd Street across Vanderbilt Avenue.

The Preferred Alternative would add approximately 2,310 passengers southbound in the AM peak hour (5,240 in the entire 4-hour 6 to 10 AM peak period). With the express and local subway lines each operating at 24 trains per hour, this addition of LIRR commuters would result in increased line-haul capacity utilization rates from 1.12 on the express line under the No Action Alternative to 1.17 under the Preferred Alternative, and from 0.61 on the local line under the No Action Alternative to 0.64 under the Preferred Alternative, as shown in Table 9C-58. On average, each car of each express train would have 6 additional riders, while each car of each local train would have 3 additional riders. The increased capacity utilization on the express line would represent a significant impact of the Preferred Alternative, while the condition on the local line would not. For comparative purposes, the MESA study also indicated that the IRT 86th Street station currently experiences utilizations of 120 percent or higher on express lines.

Table 9C-58

Lexington Avenue Subway Line-Haul Conditions at 42nd Street Grand Central Station (Preferred Alternative Year 2010): Second Avenue Subway: Downtown (AM Peak)

Subway Lines	Trains/ Hour	Cars/ Hour	Total Guideline Capacity/Hour (passengers/ hour)	Passengers/ Hour	Utilization Rate
Nos. 4 and 5 Express Trains	24	240	26,400	30,980	1.17
No. 6 Local Train	24	240	26,400	17,026	0.64

One strategy to mitigate line-haul capacity impacts would be to add trains during the peak hour. Currently, dwell times at the 42nd Street station are long, resulting from high volumes of riders getting on and off Lexington Avenue line trains. A variety of initiatives, noted above, are designed to reduce dwell times to allow additional trains through the station. Operation of several additional trains in the peak hour is physically possible, and it is NYCT's policy to bring this about. To complement these measures, it is possible to modify stairwell configurations, add stairwells, and modify the design of the mezzanine level (described above) to better distribute passengers on the subway platform. This mitigation plan would at least partially mitigate line-haul impacts by spreading some of the platform crowding and reducing dwell times.

It should be noted that a Draft Environmental Impact Statement/Major Investment Study has been issued for the MTA New York City Transit's Manhattan East Side Alternatives (MESA) Study which has a goal of improving mobility and reducing crowding on the East Side of Manhattan. To address these goals, the MESA Study has identified alternatives which include construction of a new East Side Subway line under Second Avenue from 63rd Street to 125th Street, continuing via the unused Broadway Line express tracks to west Midtown and Lower Manhattan. New stations would be provided along the line in the Upper East Side and East Harlem, and a passenger transfer to the Lexington Avenue subway line would be provided at the 125th Street station. The new subway line would be built so as not to preclude future extensions south of 63rd Street or north of 125th Street.

The new East Side subway line is projected to attract current Lexington Avenue subway line customers destined for West Midtown, as well as residents of the far East Side of Manhattan (east of Second Avenue) who currently have to walk to Lexington Avenue for subway service.

Table 9C-60
2010 Preferred Alternative Crosswalk Pedestrian Levels of Service: GCT Study Area

Location	Crosswalk	AM	Midday	PM
Lexington Avenue at 42nd Street	North	E	D	E
	West	E*	D	E*
Lexington Avenue at 43rd Street	North	E	N/A	N/A
Lexington Avenue at 45th Street	South	C	D	C
	West	D	D	D
Madison Avenue at 43rd Street	North	D	B	D
	East	E*	E*	E*
	South	D	C	D
Madison Avenue at 44th Street	North	C	B	C
	East	D	E*	E*
	South	D	D	C
Madison Avenue at 45th Street	North	E	C	D
	East	D	D	E*
	South	C	C	D
Madison Avenue at 46th Street	North	B	B	B
	East	E	E*	E*
	South	D	C	C
Madison Avenue at 47th Street	North	D	B	D
	East	D	E*	E*
	South	C	C	C
Madison Avenue at 48th Street	North	E*	D	D
	East	E*	E*	E*
	South	C	C	C
Vanderbilt Avenue at 42nd Street	North	E	E*	E
	East	D	C	C
Vanderbilt Avenue at 44th Street	North	D	C	C
	West	C	C	C
Vanderbilt Avenue at 45th Street	North	D	E	D
	East	D	D	D
	South	D	E	E
	West	C	C	C
Vanderbilt Avenue at 46th Street	North	B	C	B
	East	C	D	C
	South	B	D	B
	West	C	C	C
Vanderbilt Avenue at 47th Street	South	C	C	C
	West	C	C	C
Park Avenue at 48th Street	North	B	B	B
	East	D	C	D
	South	B	B	B
	West	D	D	D
Park Avenue at 42nd Street	East	D	C	C
	West	C	C	D

Note: * Significant impact.

In terms of pedestrian volumes that could be expected outside of GCT, the total AM peak 4-hour volume (about 64,985 person trips) was reduced by trips destined to IRT subways (7,460), since they would not be leaving the terminal but confining their walk paths to within GCT. Local bus riders (7,575) and taxi patrons (1,115) were also subtracted, since these were assumed to walk very short distances to adjacent bus stops or to nearby taxi stands directly outside GCT or the GCN elements. Overall, this would leave some 48,835 walk trips utilizing the sidewalks and crosswalks surrounding GCT during the AM peak 4-hour period (about 21,535/18,300 in the AM/PM peak hours; about 5,900/4,900 in the AM/PM peak 15-minute periods).

The assignment of new pedestrian trips concentrated on the sidewalks surrounding GCT and to points through and out of the main traffic study area (40th through 48th Streets, Third through Fifth Avenues), outside of which these walking platoons would be less concentrated and their effects less discernable. Pedestrians were traced entering and leaving the terminal from each doorway as identified in previous steps. In general, pedestrians tend to utilize the GCT interior passageways before moving outside; this is consistent in the manner in which pedestrians were assigned from LIRR trains.

The corner reservoirs were also sampled as to how people split between crosswalks, since two choices are available at each street corner (e.g., either north or west). For the most part, people walking along sidewalks tend to traverse either crosswalk in proportion to the available green signal time that gives them a gap in the opposing vehicle flows. Thus, when walking up Madison Avenue in the AM, which is allocated about 60 percent of the signal system's total cycle length, about 60 percent of the pedestrian flow tends to continue walking north along the avenue, while the balance of the flows wait to move across Madison Avenue when the side streets get the remaining 40 percent of the signal cycle.

LIRR-generated pedestrian flows would increase by as much as 900 to, at one particular corner, 2,400 per hour at the 48th Street/Park Avenue corner where the GCN element at the Westvaco building would draw a significant proportion of new LIRR commuters. Pedestrians crossing the 45th Street midblock to use the Helmsley Walk arcades between Vanderbilt and Lexington Avenues would increase by about 2,430 in the 8-9 AM hour, or about 30 percent over No Action volumes of about 8,000. Across Vanderbilt Avenue at 42nd Street (GCT's southwest corner), almost 500 more pedestrians would be added to No Action AM peak hour volumes of 4,400 (an 11 percent increase). The crosswalks at GCT's southeast corner at 42nd and Lexington would be used by about 3,000 pedestrians in the future No Action case, which would then increase by an additional 150 to 350 pedestrians in the AM peak hour. Madison Avenue's east side crosswalks at 44th and 45th Streets would be used by an additional 700 to 900 north/south pedestrians, a near doubling of future No Action flows. Between 48th and 49th Streets, incremental pedestrian flows on the east sidewalks would range between 2,000 and 3,000 pedestrians, one of the highest single loaded locations, since it is very near the LIRR's new 48th Street underground crosspassage and since many pedestrians would be destined to areas northwest of GCT.

During the PM peak hours, while the LIRR-generated pedestrian flows would be about 15 percent lower than the comparable AM peak periods, there would tend to be more pedestrian impacts, since there appears to be a significant portion of sidewalk space already lost to bus passenger queues and store refuse placed outside. Incremental LIRR pedestrian flows during the midday hour are typically about 25 percent of the combined peak AM and PM flows. Assigned flows are generally between 100 and 400 pedestrians per location, with a high of 650 to 1,300

During different time periods, the area's already narrow sidewalks are cramped considerably by a variety of conditions. In the AM, refuse bags left at corners near their containers await pickups by New York City Department of Sanitation or private carters, create restrictions in reservoir spaces, and can narrow crosswalks themselves, since pedestrians walk paths have been altered at their crossing origin. One measure to clear sidewalk space is a quick removal of these obstructions, perhaps on a half-hourly basis, by a roving collector during weekday peak periods.

Sidewalk vendors could be removed through active enforcement by police personnel. Newspaper kiosks and flower boxes could be eliminated or shifted to other, less-obtrusive, areas.

During the PM peak periods when many pedestrians are homebound, sidewalks are made even narrower by long queues of people awaiting private express and local buses along nearly each block along Madison Avenue in Midtown. Just about each block along Madison Avenue has four or more bus stops along it. There are two blocks, however, that have only one or no bus stops, those being the 43rd through 44th and 50th through 51st blockfaces which are free of any bus stop paraphernalia, such as sign posts and shelters that constrict walk space. At these locations, there is considerably more maneuverability afforded to pedestrians in their travels. It may be possible that the five blocks between 43rd and 48th Streets have to be cleared entirely of any bus stops, since this is the area adjacent to GCT and its new access locations. In doing so, the clear conditions at the bus stop-free blocks can be replicated in this area. However, since this may create additional sidewalk crowding at nearby blocks for people boarding their buses there, and impact those riders, this is not necessarily recommended, but the concept could be studied further.

Another sidewalk interference noted during the late afternoon hours occurs when store merchants place their rubbish either at the curb or next to their front door to await private-carter pickup. In doing so, yet another sidewalk obstruction has been created. The Grand Central Partnership (GCP) can enforce storage restrictions to, say, after 6 PM when the commuter pedestrian flows have abated, and the need for maximum sidewalk space has lessened.

Other scattered fixed objects force pedestrians to weave in and out to avoid contact which, in turn, reduces sidewalk capacities. Some objects can be modified, many should be moved or eliminated, since their presence is not essential, as examples that follow show. Refuse containers' shape, size, and position can be changed to a rectangular form with smaller dimensions and positioned directly along the curb (an area that is usually not utilized by walkers), instead of jutting out in the middle of pedestrian sidewalk space. The Grand Central Partnership newspaper kiosks are one example of a better shaped form; however, these, too, are located about 2 feet in from the curb, which has actually created a small "dead zone" on the sidewalk that, with a slight shift of the kiosk closer to the curb, can be reclaimed as usable sidewalk space. Private bus companies have placed large concrete blocks haphazardly along curbs to hold their sign posts. The GCP has placed many various-sized planters either along the curb or against buildings that can be relocated. The east side of Madison Avenue between 43rd and 44th Streets has two modest-sized trees contained in ground-level fenced planters that could be transplanted elsewhere.

For narrower 15-foot crosswalks that would operate over capacity, widening their widths to 20 feet would provide for additional pedestrian crossing capacity; such widenings should not significantly decrease the amount of street space available for vehicles queuing along that particular street segment. Also, any street furniture on the receiving sidewalk must be relocated to

Table 9C-59

2010 Preferred Alternative Corner Reservoir Pedestrian Levels of Service: GCT Study Area

Location	Corner	AM	Midday	PM
Lexington Avenue at 42nd Street	Northwest	E*	C	D
Lexington Avenue at 45th Street	Southwest	D	E	D
Madison Avenue at 43rd Street	Northeast	D	C	C
	Southeast	D	C	C
Madison Avenue at 44th Street	Northeast	C	C	C
	Southeast	D	D	D
Madison Avenue at 45th Street	Northeast	E*	D	E*
	Southeast	C	C	D
Madison Avenue at 46th Street	Northeast	B	B	C
	Southeast	D	C	C
Madison Avenue at 47th Street	Northeast	C	B	C
	Southeast	C	D	D
Madison Avenue at 48th Street	Northeast	D	C	D
	Southeast	B	B	B
Vanderbilt Avenue at 42nd Street	Northeast	C	B	C
Vanderbilt Avenue at 44th Street	Northwest	B	B	B
Vanderbilt Avenue at 45th Street	Northwest	C	D	D
	Southwest	B	C	C
	Southeast	B	C	C
Vanderbilt Avenue at 46th Street	Northeast	B	C	B
	Southeast	B	C	B
	Northwest	B	B	B
	Southwest	B	C	B
Vanderbilt Avenue at 47th Street	Southwest	B	B	B
Park Avenue at 48th Street	Northeast	C	B	C
	Southwest	B	B	B

Note: * Significant impact.

Manhattan to the Cloisters in Inwood, following Madison Avenue (northbound) and Fifth Avenue (southbound) throughout East Midtown and the Upper East Side. The Q32 operates on 8-minute headways during the AM and PM peak period and also extends north- and southbound via Madison and Fifth Avenues (respectively), continues over the Queensborough Bridge and then along Queens Boulevard and Northern Boulevard to its easterly terminus in Jackson Heights. It would appear unlikely that bus service on either of these routes would be reduced due to lower ridership at the extreme southern end of the route at Penn Station.

PREFERRED ALTERNATIVE (OPTION 2)

Under this alternative, the LIRR station and platform/track level would be constructed at a depth of approximately 120 feet below the street level below the western portion of GCT. Between the street level and the tracks, two intermediate levels would be constructed. Below the street level, a mezzanine area would be constructed between 43rd and 48th Streets as a waiting and retail area for LIRR passengers before they descend to other station levels below. The next level below the mezzanine would be a series of three east-west crosspassages lying approximately under 44th, 46th, and 48th Streets that would allow passengers to switch platforms below if needed. These four main levels (i.e., platform, crosspassage, mezzanine, street) would be connected by a number of vertical circulation elements, including high-efficiency escalators between the crosspassages and mezzanine.

At the street level, with one exception, all street accesses detailed in the discussions of Option 1 earlier in this would be the same, albeit with some minor shifting of positions along the same blockface. The single exception would be the street entrance into 200 Park Avenue at the southeast corner of 45th Street and Vanderbilt Avenue under Option 1, which would be eliminated under Option 2. In its place, another new street entrance would be constructed nearby along 44th Street between Vanderbilt and Madison Avenues to maintain the same total number of street access points, thus maintaining the same LIRR passenger assignments to Manhattan work destinations as in Option 1. In turn, traffic, taxi, bus, and street pedestrian impacts would be nearly the same as detailed in Option 1 since the same number of pedestrians would be assigned to the same street locations.

Both options would make use of the 47th Street crosspassage, with one major difference. In Option 2, LIRR riders would use the same street accesses as described in Option 1. However, to access the mezzanine level, which would be below the 47th Street crosspassage, LIRR riders would use a stair bank positioned near the existing west spine (i.e., the Northwest Passage) stairwell. While LIRR riders would have to use the existing crosspassage, they would not queue and wait in it but rather walk through it as another link in their path to the mezzanine below and the street above. In Option 1, which would have no LIRR mezzanine level, LIRR platforms would be constructed just below the 47th Street crosspassage, with their passengers being required to both walk along the crosspassage and at times wait within it. Option 1 would also have a separate LIRR waiting space constructed just north of the 47th Street crosspassage's west end. LIRR patrons would also be able to access this waiting area via the LIRR 48th Street crosspassage since this new waiting space would run the length of the block between 47th and 48th Streets.

For Option 2, LIRR passengers would still access the 47th Street crosspassage and use a new vertical circulation element to descend to their mezzanine one level down. During the first 15 minutes when all train departures would be delayed, examining the crosspassage's east and west ends in which only MNR passengers would wait and through which LIRR passengers were

Table 9C-61
2010 Preferred Alternative Mid-Block Pedestrian Levels of Service: GCT Study Area

Location	Side	Platoon LOS		
		AM	Midday	PM
Lexington Avenue between 43rd and 44th Streets	West	E	D	E
Madison Avenue between 43rd and 44th Streets	East	C	C	C
Madison Avenue between 44th and 45th Streets	East	C	C	D
Madison Avenue between 45th and 46th Streets	East	D	C	D
Madison Avenue between 46th and 47th Streets	East	C	C	D
Madison Avenue between 47th and 48th Streets	East	D	D	D
Vanderbilt Avenue between 45th and 46th Streets	East	B	B	C
	West	B	B	B
Vanderbilt Avenue between 46th and 47th Streets	East	B	B	B
	West	B	B	B
43rd Street between Madison and Vanderbilt Avenues	North	E*	C	E
	South	C	C	C
45th Street between Madison and Vanderbilt Avenues	North	C	C	C
	South	D	D	E*
46th Street between Madison and Vanderbilt Avenues	North	B	B	B
	South	B	B	B
47th Street between Park and Lexington Avenues	South	B	B	B
47th Street between Vanderbilt and Park Avenues	North	B	B	B
	South	B	B	B
47th Street between Vanderbilt and Madison Avenues	North	B	B	B
	South	B	B	B
48th Street between Park and Lexington Avenues	North	B	B	B
48th Street between Madison and Park Avenues	South	C	B	C

Note: * Significant impact.

Two specific midblock locations between Madison and Vanderbilt Avenues on 43rd Street (north side) and 45th Street (south side) would be significantly impacted with LIRR pedestrians added during the AM and PM peak periods. These are sidewalk areas situated directly outside GCT exits. While there would be no other significant pedestrian impacts in the area, there would be a significant increase in the number of people walking through this area that create LOSs at near-threshold congested conditions. Also, since some crosswalks would be significantly impacted with the LIRR pedestrian overlay, there could be some ripple effects along the sidewalk areas just upstream. In fact, this is evidenced today as people cross midblock and sometimes dodge traffic to avoid the crowded crosswalks. The types of measures that would clear more sidewalk space and avail pedestrians of more walking capacity are discussed below.

One practical mitigation strategy that could be employed to the sidewalk areas around GCT is clearing or limiting street furniture and other impediments that block the paths of pedestrians. Some would require permanent relocation, others would need to be eliminated completely, while still other clearances would need regular enforcement to prevent recurrence.

conditions along the Lexington Avenue line. There would also be some significant impacts on a limited number of physical elements within GCT. The detailed analyses of these impact and required mitigation are documented within the immediately preceding section of this DEIS.

Significant vehicular traffic impacts could be mitigated via a range of standard low-cost, readily implementable traffic capacity improvements that fall within the day-to-day operational responsibilities of NYCDOT. These include, for example, the following: signal phasing and timing modifications, including provision of protected signal phases for turning movements, provision of dual turning lanes in place of a single lane at a select number of locations, and more restrictive parking regulations.

Significant impacts on pedestrian movements have been identified at a number of locations. Improvements needed to mitigate these impacts could include: widening crosswalks; relocating or removing tree planters, refuse containers, or other sidewalk impediments to smooth pedestrian flows.

One significant impact was identified within the west end of GCT—at the new escalator bank installed across from the NYCT Transit Museum. The significant impact on this vertical circulation element could be mitigated by providing "up" flows on both escalators in the AM peak and "down" in the PM peak, and reverting back to one escalator per direction during midday, to accommodate the sharp peaking characteristics of commuters in the peak periods.

A number of significant impacts were identified on the IRT Lexington Avenue subway line—along the stairwell/escalator banks leading to it from the upper concourse of GCT, through its fare control area, along its stairwell connections to the platform level, along the platforms themselves, and on the line-haul capacity of the Nos. 4 and 5 express lines. The specific improvements needed to mitigate these significant impacts are outlined and evaluated in the preceding section. They include the following specific measures:

- A new turnstile bank just west of FCA No. 238 to "siphon off" people in the free passageway directly into the IRT's mezzanine area.
- A new south-end stairwell (P10) to continue siphoning off people from the new turnstiles, and reduce use of overcrowded stairwell P14.
- Widening of the corridor mouth into space currently occupied within the Pershing Building's basement where the "paid" shuttle corridor leads into the IRT's mezzanine to allow construction of new stair P10.
- An enlargement of FCA No. 238's "turnstile line" farther east into the IRT's mezzanine to create additional circulation space in this control area; re-positioning and reduction of the size of the existing large token booth would also be needed.

Significant line-haul capacity impacts could be partially mitigated by redesigning the mezzanine level of the Lexington Avenue/42nd Street station, adding stairwells, and modifying other stairwell configurations. This would reduce some platform crowding, better distribute passenger loads, and decrease train dwell times by a more efficient distribution of passenger egress/ingress.

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maximize the crosswalk widening's benefit. Additional green crossing time could also be provided, although care should be directed in not creating a significant vehicular traffic impact.

Using these improvement measures at sidewalks and crosswalks indicate that most of the significant pedestrian impacts can be eliminated or reduced. For example, along 43rd Street between Madison and Vanderbilt Avenues, a cleared sidewalk would operate at a LOS D, with platoon spacings slightly better than indicated in No Action conditions. At GCT's southeast corner at the Lexington Avenue/42nd Street intersection, widened crosswalks with cleared corners would result in LOSs in the D/E range in the crosswalk, or the same conditions as in the 2010 No Action condition. At this same corner, cleared of street furniture and enlarged to match the widened crosswalk width, LOS D in the peak AM and PM periods would prevail to match No Action conditions. The northeast corner of Madison Avenue and 45th Street would operate at LOS C to D in the AM and PM peak periods with a cleared corner reservoir (see Tables 9C-62 and 9C-63).

Table 9C-62
Mitigated Preferred Alternative Corner Reservoir Pedestrian Levels of Service: GCT Study Area

Location	Corner	AM	Midday	PM
Lexington Avenue at 42nd Street	Northwest	D	C	C
Madison Avenue at 45th Street	Northeast	D	C	D

Table 9C-63
Mitigated Preferred Alternative Crosswalk Pedestrian Levels of Service: GCT Study Area

Location	Crosswalk	AM	Midday	PM
Lexington Avenue at 42nd Street	West	E	D	E
Madison Avenue at 43rd Street	East	E	E	D
Madison Avenue at 44th Street	East	D	E	D
Madison Avenue at 45th Street	East	D	D	D
Madison Avenue at 46th Street	East	D	D	E
Madison Avenue at 47th Street	North	D	D	E
Madison Avenue at 48th Street	North	E	C	D
	East	D	E	E
Vanderbilt Avenue at 42nd Street	North	E	E	E

Buses

The Preferred Alternative would likely result in reduced ridership demand on bus routes that currently provide connecting service from Penn Station to East Midtown, such as the M4 and the Q32. The ridership modeling for this project does not develop ridership levels on a route-by-route basis, so the volume M4 and Q32 riders that would divert onto direct LIRR service to GCT has not been quantified. Bus load levels on both routes would decrease, perhaps significantly, in the AM and PM peak commutation periods. The M4 operates on 4-minute headways in the AM and PM peak periods and extends north- and southbound over nearly the entire length of

Table 9D-1

Existing Traffic Level of Service Summaries: Sunnyside Study Area

Intersection	AM LOS	LOS E or F Movements	PM LOS	LOS E or F Movements
Queens Boulevard and Van Dam Street/ Thomson Avenue	F*	All movements LOS E, F or F*, except EB Thomson Avenue and WB Queens Boulevard rights.	F*	NB Van Dam Street throughs and rights, and WB Queens Blvd rights (LOS F*); EB Thomson Avenue (LOS E).
Queens Boulevard and Skillman Avenue	F*	All movements LOS E, F or F*.	F*	All movements, except SB Skillman Avenue (LOS F*).
Queens Boulevard and Jackson Avenue/ Queens Plaza East	F*	WB Queens Boulevard left/ throughs (LOS F*) and rights (LOS E); NB Jackson Avenue left/throughs (LOS E).	F*	WB Queens Blvd left/ throughs (LOS E) and NB Jackson Avenue left/ throughs (LOS F*).
Northern Boulevard and Queens Plaza North/ 41st Avenue	F*	All movements LOS E or F*, except WB 41st Avenue.	D	—

PARKING

The Sunnyside/Long Island City area has a number of parking lots and garages available to the public. Most prominent in this supply is the Municipal Garage, operated by Kinney and located at the southwest corner of Queens Plaza South and Jackson Avenue. This parking facility has a capacity of 1,038 spaces and is typically about 80 percent occupied on weekdays. There are other smaller parking facilities in the general area; however, it is not expected that there would be a significant level of park-and-ride activity at the proposed Sunnyside station. Most riders would walk to or from their local origins/destinations, some would take subways or buses, and a small number would use taxis or be dropped off or picked up by car. Therefore, a complete inventory of available parking facilities was not needed for this DEIS.

PEDESTRIANS

Sections of Sunnyside/Long Island City that are reasonably close to the proposed Sunnyside station are characterized by moderate levels of pedestrian activity. These activity levels are heaviest in the vicinity of Queens Plaza, where there is a significant amount of employment, and east of the proposed station location near LaGuardia Community College and other destinations below Thomson Avenue and east of Skillman Avenue.

The LIRR Sunnyside station would be located directly under the Queens Boulevard viaduct over the Sunnyside yards. The destination of LIRR commuters leaving the station would likely be oriented either west to employment areas near Queens Plaza or southeast to employment/educational destinations south of Thomson Avenue. Therefore, two pedestrian analysis locations were selected for detailed study: crosswalks and corner reservoir areas at Queens Boulevard/Jackson Avenue in the Queens Plaza area; and crosswalks and corner reservoir areas at the intersection of Queens Boulevard, Thomson Avenue, and Van Dam Street.

considered to only walk on their way to the mezzanine below, the analysis results indicate that conditions would be near capacity. In a 30-minute delay period, the analyses indicate that significant congestions would occur throughout the crosspassage. The limit of capacity in the crosspassage would be reached in about 36 minutes after a delay is first encountered, close to the 40-minute threshold under the No Action Alternative and as compared to 15 minutes under Option 1.

Many pedestrians destined to areas south of 42nd Street would walk through GCT as a link in their travel. A significant difference between Options 1 and 2 would be related to the means of processing people within GCT. In Option 1, pedestrians entering GCT would use one of two vertical circulation elements that carry people up directly into the Biltmore Room under 43rd Street. Pedestrians would also be able to enter GCT's lower concourse near and just west of track 116 after walking through a small waiting area at the south end of LIRR tracks. In Option 2, all pedestrians would first enter the Dining Concourse near track 116 to make their way upward using a number of vertical circulation elements available such as the Oyster Bar ramps and the new escalator bank bringing people up near the NYCT Museum Store. Since LIRR riders would be able to use any of the vertical circulation elements between GCT's lower and upper concourses, there would be little or no major shifts of pedestrian flows through either concourse when comparing each option to each other.

In terms of impacts to the Lexington subway lines, both options would require all subway patrons to walk through GCT's lower and upper concourses to access the 42nd Street station. Thus, there would be no difference in the number of and paths used by pedestrians assigned into that subway station and in the level of impacts created.

TSM ALTERNATIVE

Under the TSM Alternative, there would be no LIRR service at GCT and no additional service at Penn Station. There would be some additional ridership on LIRR trains arriving at the LIRR's terminal stations at Hunters Point Avenue, Long Island City, and Flatbush Avenue.

It is projected that close to 550 to 650 additional LIRR commuters would arrive at the Hunters Point Avenue terminal station in the AM peak hour, the vast majority of whom would then transfer to westbound IRT No. 7 Flushing line trains to Manhattan's East Side at the No. 7 line's Hunters Point Avenue station. These No. 7 trains are already subjected to serious crowding conditions, so the addition of new riders would exacerbate those conditions. About 40 to 50 new LIRR riders are projected to use the very infrequent LIRR service to its Long Island City station; many of these riders would also transfer to the No. 7 line at its Vernon-Jackson station.

It is also projected that about 350 AM peak hour LIRR riders would travel to the Flatbush Avenue terminal in downtown Brooklyn and transfer to the northbound Nos. 2,3, 4, and 5 lines. Those lines are also subjected to serious crowding levels, and the addition of new LIRR commuters there would exacerbate those conditions.

There would likely be no significant change in traffic or pedestrian conditions at Penn Station, nor would there be any significant impact at GCT.

MITIGATION SUMMARY

The Preferred Alternative would generate significant impacts on vehicular and pedestrian traffic on the street network immediately adjacent to Grand Central Terminal, on pedestrian circulation elements leading to and within the Lexington Avenue line subway station and on line-haul

Although nearly all of these routes are within a reasonable distance of the proposed Sunnyside station, it is not anticipated that a significant volume of LIRR riders would access the station by bus. Therefore, an analysis of bus load levels was not needed for this DEIS.

FUTURE CONDITIONS COMMON TO ALL ALTERNATIVES

For future year 2010 conditions, existing traffic volumes were increased by a background growth rate of 0.5 percent per year, which is higher than assumed background traffic growth rates in the GCT area, as suggested in New York City's *CEQR Technical Manual*. Vehicle traffic that is expected to be generated by two major actions—the full buildout of the Queens West/Hunters Point Waterfront Development Project planned to encompass approximately 9 million square feet of new commercial and residential space, and the traffic expected to be generated by the New York City Department of City Planning's proposed rezoning of a 32-block area in Long Island City—was also included.

Overall, these two actions—Queens West and Long Island City rezoning—would generate a substantial volume of vehicle trips in the AM and PM peak hours throughout the area, a percentage of which would pass through the four intersections analyzed in this DEIS. Between existing conditions and year 2010 No Action conditions, traffic volumes through the four analysis locations are projected to increase by about 15 percent overall (increases range from intersection to intersection).

For traffic impact analyses under the No Action and Preferred Alternatives, the same significant impact criteria defined earlier in this for the Grand Central Terminal area were also used for the Sunnyside area: (1) No Action LOS A, B, C, or D deteriorating to LOS E or F under conditions with the Preferred Alternative, providing that the average vehicle delay increase is 10 seconds or more; and (2) No Action LOS E deteriorating to LOS F for the conditions with the Preferred Alternative providing that the average vehicle delay increases by 10 seconds or more. Deterioration from the No Action condition to the Preferred Alternative condition within either LOS E or F with 10 seconds or more of additional delay is defined as a significant worsening of a pre-existing problem.

Since the analyses conducted for year 2010 conditions under the Preferred Alternative (see following section) indicated that there would be no significant impacts, and year 2020 demands would be only marginally higher, year 2020 analyses were not needed.

PROBABLE IMPACTS OF PROJECT ALTERNATIVES

NO ACTION ALTERNATIVE

As shown in Table 9D-2, intersections currently operating at LOS F* would deteriorate further, with increased traffic delays at each location. The one intersection operating at overall LOS D in the PM peak hour would deteriorate to overall LOS F*. Pedestrian analysis locations currently operating at LOS A or B conditions would remain at those levels of service. There would be no significant deterioration at any of the street corners or crosswalks analyzed.

D. SUNNYSIDE/LONG ISLAND CITY AREA

The Preferred Alternative of the East Side Access Project would create a new station adjacent to Sunnyside Yard, underneath the Queens Boulevard viaduct. This new station would be expected to serve primarily LIRR commuters who work in the local area, and provide another option for LIRR commuters who wish to transfer to the subway en route to destinations in Manhattan. The majority of LIRR commuters using this station would likely walk from the station to their workplace, or could transfer to the subway for a short second "leg" of their overall trip. A modest number would use buses or taxis to reach their final trip destination. Overall, these would not be significant impacts in the Sunnyside/Long Island City area, as is documented in this section of the DEIS.

EXISTING CONDITIONS

TRAFFIC

The Sunnyside area is the focus of substantial traffic volumes, including traffic destined to the immediate area as well as through-traffic en route to work places just over the Queensboro Bridge in Manhattan. The major east-west traffic arterial in the area is Queens Boulevard, which leads directly onto the lower level of the Queensboro Bridge. It is heavily trafficked during both the AM and PM peak periods (westbound into Manhattan in the AM, and eastbound out from Manhattan in the PM). Since the Queensboro Bridge is not a tolled facility (as opposed to the Queens-Midtown Tunnel about 1 mile south), it attracts a high volume of commuter traffic either via Queens Boulevard or via the Long Island Expressway en route to the bridge's upper and lower levels via northbound Van Dam Street.

A set of four representative critical locations was selected for detailed analysis: Queens Boulevard at Van Dam Street and Thomson Avenue, a critical location comprising two intersections where motorists decide whether to continue on Queens Boulevard toward Manhattan via the lower level of the Queensboro Bridge, or turn onto Thomson Avenue to travel to Manhattan via the upper level of the bridge; Queens Boulevard at Skillman and Jackson Avenues, which are the two critical intersections at the east and west ends of the Queens Boulevard viaduct over the Sunnyside Yards, the site of the proposed Sunnyside station; and the intersection of Northern Boulevard, Queens Plaza North, and 41st Avenue, another important intersection for traffic from the north heading into both the study area and toward the bridge. The ridership projections for Sunnyside station do not indicate that there would be a substantial volume of vehicle trips to and from this station, so this set of four heavily trafficked locations near the station site would indicate the potential for traffic impacts from the East Side Access Project.

Traffic conditions along the corridors leading into the area and to and from the upper and lower levels of the Queensboro Bridge are highly congested during the AM and PM peak traffic hours and throughout much of the extended peak periods. As shown in Table 9D-1, all four locations analyzed in the AM peak hour are operating at congested level of service (LOS) F* conditions (with the F* indicating that at least one traffic movement at the intersection is operating at severe congestion levels). During the PM peak hour, three of the four intersections operate at LOS F* conditions, with the fourth intersection at overall LOS D. These LOS findings depict the bumper-to-bumper conditions in the area along the Queens Boulevard/Queens Plaza North and South corridor during peak commuter hours.

TSM ALTERNATIVE

Since there would be no LIRR station at Sunnyside under the TSM Alternative, conditions would be the same as under the No Action Alternative. Under the TSM Alternative, additional LIRR ridership would transfer to the No. 7 Flushing subway line at its Hunters Point Avenue station, adding approximately 530 riders on the No. 7 trains during the AM peak hour and further congestion to its operation.

MITIGATION

Since the Preferred Alternative of the East Side Access Project would not generate any significant traffic, parking, transit, or pedestrian impacts in the Sunnyside area, there would be no need for any mitigation measures.

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Pedestrian volumes were counted during September 1999, when LaGuardia Community College opened after Labor Day. These counts indicated that pedestrian volumes are light at Queens Boulevard/Jackson Avenue (20 to 30 pedestrians use its crosswalks during the AM, midday, and PM peak 15-minute periods). Pedestrian volumes are somewhat heavier at Queens Boulevard/ Thomson Avenue/Van Dam Street, since commuting students use these crosswalks from the Rawson/33rd Street station of the No. 7 Flushing line just east of the intersection. Pedestrian volume counts ranged from a low of about 50-70 people using the north-south crosswalk of Thomson Avenue in the midday and PM, to a high of about 700 people crossing Van Dam Street in the AM peak period. Pedestrian LOS analyses indicated that pedestrian conditions are acceptable for all crosswalk and corner reservoir areas analyzed, with one exception. The south crosswalk of Van Dam Street is very busy as it connects the main LaGuardia College building to the nearby No. 7 Flushing line a few blocks to the east. LOSs at this crosswalk are between C and D during all peak analysis periods, indicating some slight pedestrian congestion.

SUBWAYS

The Sunnyside/Long Island City area is served by a significant amount of subway service. This includes stations along several lines—the E, F, G, and R lines at the Queens Plaza station; the N and No. 7 lines at Queensboro Plaza station; and the No. 7 line at the Rawson/33rd Street station. These lines carry substantial passenger volumes into and out of Manhattan in the AM and PM peak periods. Crowding is severe on the E and F lines in the rush hours, even though the combined headway on these lines is among the shortest in the subway system. Subway operations along the E, F, and No. 7 lines during these periods approach or match the theoretical capacity of their respective tunnels into Manhattan (i.e., the Steinway and 53rd Street tunnels, respectively).

The Queens Plaza and Rawson/33rd Street stations are also significantly used in the AM and PM peak periods. The Queens Plaza station is used by subway riders exiting the system for work destinations in the immediate area, and by auto commuters who park at the Municipal Garage at the southwest corner of Queens Plaza/Jackson Avenue and then board one of the various subway routes traveling to Manhattan. The 33rd Street station is heavily used by LaGuardia Community College students going to school. It is not anticipated that the volume of LIRR commuters who may transfer to one of these subway lines would be enough to create significant impacts on subway services or conditions, so further analyses were not warranted.

BUSES

The proposed LIRR Sunnyside station would be located near five local and four express bus routes, which are operated either by NYCT, Green Bus Lines, the Queens Surface Corporation, or the Triboro Coach Corporation. The Q32 and Q60 routes, operated by NYCT and Green Lines, respectively, provide local bus service along Queens Boulevard. Each operates at 8-minute headways (planned time intervals between buses) during the peak periods. The X51, X63, X64, and X68 routes, operated by NYCT, provide express bus service along Queens Boulevard from different sections of north- and southeast Queens. Their headways vary, but are generally in the 10-20 minute range in peak periods. The Triboro Coach route Q39 originates in the Ridgewood section of central Queens and operates along 48th Avenue, Van Dam Street, and Thomson Avenue within the study area, at 4-minute headways in the AM peak and 7-minute headways in the PM peak. The Q101 operated by Queens Surface extends from Astoria, Queens, to 59th Street/Second Avenue in Manhattan via Steinway Street and Northern Boulevard. It operates at a 15-minute headway in the AM peak and a 20-minute headway in the PM peak.

two blocks south of the station and at a critical traffic location within the area; and, Mineola Boulevard and 2nd Street, at the foot of the overpass over the LIRR tracks on the north side of the station.

The *Hicksville* station serves both Port Jefferson and Ronkonkoma branch trains and is one of the most heavily utilized stations in the LIRR system. Boardings during the AM peak reach 6,290. The station has several parking lots surrounding it; the major parking garage can accommodate 1,272 commuter vehicles. Overall, there are 3,328 parking spaces at the station and they are fully utilized. The station is served by several bus routes that connect it with several businesses, shopping centers, and hospital facilities in the adjoining area. Four intersections located in the generally commercial area bordering the station were analyzed in detail: Route 106/John Street and Route 107/John Street just north of the station; Route 106 and Duffy Avenue, one block south of the station at the corner of the station's commuter parking garage; and Woodbury Road at Bay Avenue/East Barclay Street, just east of the station.

Huntington is the busiest station on the Port Jefferson branch east of Hicksville, with 4,628 riders boarding during the AM peak period. The station straddles a low-density commercial street (Route 110/New York Avenue) in a mixed-use area. Huntington station has 3,820 parking spaces within a number of parking lots and two multi-level parking garages. On a typical weekday, its parking facilities are 95 percent occupied. The station is served by two bus routes that connect the station with Walt Whitman Mall and local hospitals. Two traffic locations were analyzed: the intersection of Route 110/New York Avenue and Broadway, immediately adjacent to the western edge of the station and at the focus of all of the station's various parking facilities; and Broadway and Park Avenue, about ½ mile to the east and used by traffic approaching the station from the northeast and southeast.

The eastern terminal station on the Ronkonkoma branch, *Ronkonkoma* station is the busiest station in Suffolk County, attracting riders from an extensive catchment area due to its direct, at-times non-stop service into Penn Station. Boardings during the AM peak are 5,403. The station is located in a low-density setting, with the area north of the station primarily residential in nature and the area to the south either uninhabited or industrial. Ronkonkoma has a total of 4,998 parking spaces, including an expansive parking lot on the south side of the tracks with multiple access/egress points, and a multi-level parking garage and additional surface parking on the north side of the tracks. The multi-level garage was completed in 1995 to accommodate the dramatic increase in ridership at this station. These parking facilities are fully utilized on a typical weekday, with many vehicles parked illegally within the station's parking lots. The station is served by local Huntington Area Rapid Transit (HART) and Suffolk County Transit (SCT) bus routes. Four representative traffic analysis locations were selected: Hawkins Avenue at the north and south service roads of the Long Island Expressway (LIE) just north of the station; Hawkins and Union Avenues near the parking garage on the north side of the station; and the intersection of the ramp from Ronkonkoma Avenue (which passes over the station complex in a north-south direction) and Railroad Avenue on the north side of the station.

The *Babylon* station, on the Babylon branch, has 3,245 AM peak boarding riders. The station is situated between two commercial streets—Deer Park Avenue on the east side of the station and West Main Street a few blocks south of the station. There are several access/departure points from its parking lots, giving it good overall traffic distribution from its parking facilities. About 84 percent of its 2,026 parking spaces are utilized on a typical weekday. The station is served by two LI Bus routes and seven SCT routes. Three representative traffic analysis locations were studied: Park and Deer Park Avenues, northeast of the station; Deer Park Avenue and West

Table 9D-2
No Action Traffic Level of Service Summaries: Sunnyside Study Area

Intersection	AM LOS	LOS E or F Movements	PM LOS	LOS E or F Movements
Queens Boulevard and Van Dam Street/ Thomson Avenue	F*	All movements LOS F*, except EB Thomson Avenue and WB Queens Boulevard rights.	F*	NB Van Dam Street throughs and rights, EB Thomson Avenue, and WB Queens Boulevard rights (LOS F*); EB Queens Boulevard (LOS E).
Queens Boulevard and Skillman Avenue	F*	All movements LOS F*.	F*	All movements LOS F*, except SB Skillman Avenue.
Queens Boulevard and Jackson Avenue/ Queens Plaza East	F*	WB Queens Blvd (LOS F*); NB Jackson Avenue left/throughs (LOS E).	F*	WB Queens Blvd left/ throughs and NB Jackson Avenue throughs (LOS F*); EB Queens Plaza South main road (LOS E).
Northern Boulevard and Queens Plaza North/ 41st Avenue	F*	All movements LOS E or F*, except WB 41st Avenue.	F*	NB Queens Plaza East (LOS F*) and SB Northern Blvd (LOS F).

PREFERRED ALTERNATIVE

The results of LIRR's ridership projections indicate that the proposed Sunnyside station would generate about 1,530 new travelers in the 4-hour AM peak period in the year 2010 (675 in the AM peak hour) and 1,300 new travelers in the 4-hour PM peak period (575 in the PM peak hour). It is estimated that 90 percent would walk to or from their local destinations, 9-10 percent would transfer to or from subways or buses, and 0.5 percent would be picked up or dropped off by car or taxi. There would be no commuter parking at the new station, so park-and-ride activity with LIRR service is not expected. In the AM and PM peak hours, just 16 and 13 vehicle trips are expected, respectively, counting auto or taxi dropoffs (or pickups) as two trips—one to and one leaving the station. This volume of generated vehicle traffic is less than the level of trip-making that might have a potential for impact—New York City's *CEQR Technical Manual* states that proposed actions generating fewer than 30 vehicle trips in the peak hour do not have the potential for significant traffic impacts and therefore do not require detailed analyses.

Similarly, expected levels of subway and bus use combined would total approximately 65 person-trips in the AM peak hour and 55 person-trips in the PM peak hour. Split among the various subway and bus routes, this level of increase does not indicate the potential for significant transit system impacts (the *CEQR Technical Manual*'s threshold for potential impacts is 100 person-trips in the peak hour).

Since the project-generated pedestrian trips within the Sunnyside area could be significant (this would include walk trips to local work or school destinations as well as walk trips to nearby subway and bus routes), a detailed analysis of pedestrian LOSs in the future with the Preferred Alternative was conducted. This analysis indicated that pedestrian LOSs would continue at acceptable conditions with the Preferred Alternative in place, except at the south crosswalk across Van Dam Street, which would worsen slightly within LOS C to D with the modest addition of 10 to 20 crossing pedestrians.

E. EASTERN QUEENS AND LONG ISLAND

The Preferred Alternative is expected to increase LIRR ridership systemwide, with additional ridership anticipated for virtually all stations. Manhattan-bound commuters from eastern Queens and Long Island would have additional train service available to them—more trains, more seats, and more flexibility to get to East Side as well as West Side destinations. Most LIRR commuters traveling to and from their stations do so by car; therefore, the analysis of traffic and transportation conditions in Eastern Queens and Long Island focused on traffic and parking conditions at LIRR stations. Bus service is available at all of the major LIRR stations and is significantly used by LIRR riders at several stations. Bus services are also described in this section of the DEIS.

EXISTING CONDITIONS

TRAFFIC

The analyses that follow focus on a representative set of 15 stations out of a total 124 in the LIRR system (see Figure 9E-1). This group includes:

- Several of the most intensively used stations and some with more moderate usage;
- Stations within local business districts or shopping areas and stations situated closer to residential areas or in fringe areas;
- Stations with multiple bus routes and stations with limited bus service;
- Stations with extensive parking capacity and others with very limited parking availability;
- Stations where LIRR commuters are nearly 100 percent park-and-riders and others where a significant number of commuters take the bus or walk to the station; and
- Stations with multiple access and egress routes and others where access is limited to a confined access corridor.

Overall, the 15 stations represent the range of stations that could be affected by the project. These stations cover all of the LIRR's branches, except for the Montauk branch east of Babylon, and include Bayside, Great Neck, and Port Washington on the Port Washington branch; Mineola on the Main Line (serving the Port Jefferson, Ronkonkoma, and Oyster Bay branches); Hicksville, Huntington, and Port Jefferson on the Port Jefferson branch; Deer Park and Ronkonkoma on the Ronkonkoma branch; Valley Stream on the Far Rockaway branch; Merrick and Babylon on the Babylon branch; Hempstead on the Hempstead branch; Malverne on the West Hempstead branch; and Long Beach on the Long Beach branch (see Figure 9E-1). Profiles of these stations are provided below.

The *Mineola* station serves both Main Line (Port Jefferson and Ronkonkoma branch) trains and Oyster Bay branch trains. The station has a significant number of AM peak period (i.e., 6-10 AM) boardings (2,217). Almost all of the 564 station parking spaces are occupied (97 percent) on a typical weekday. The station is situated within the general Mineola business district. Winthrop-University Hospital is just to the north, and the County Seat's institutional complex is to the south. The station is served by seven MTA Long Island Bus (LI Bus) routes that connect this station with several of the surrounding communities, the County Seat offices nearby, and the area's numerous shopping malls and districts. Two intersections near the station were selected for detailed analysis: Old Country Road and Mineola Boulevard/Franklin Avenue north side of West Park Avenue, Long Beach's main east-west street in the heart of its business district. There are 223 parking spaces at the station and they are 90 percent utilized. The station is also accessed by two bus routes serving the Long Beach area. Three intersections along West Park Avenue were selected for detailed traffic analysis: at Centre Street, at the main station exit location; and at Park Place/Edwards Boulevard.

The *Bayside* station on the Port Washington branch is located along Bell Boulevard, Bayside's primary commercial street. The station generates 3,214 AM peak boardings on a typical weekday. There is a very limited amount of parking available in parking lots, totaling about 75 parking spaces, which are 64 percent utilized on a typical weekday (these include some short-term shopper parking spaces; all of the long-term commuter parking spaces are generally occupied). The station is also directly served by two bus routes on Bell Boulevard; three other bus routes operate a few blocks away on Northern Boulevard. Two local traffic intersections were analyzed: Bell and Northern Boulevards, the most heavily trafficked intersection in the area; and Bell Boulevard at 41st Avenue, just north of the station.

The *Valley Stream* station on the Far Rockaway branch is located just north of Sunrise Highway, three stops east of Jamaica station. In the AM peak, there are 2,209 westbound boardings. There are 1,285 parking spaces at the station and they are typically 83 percent utilized. The Valley Stream station is served by three LI Bus routes that connect it with the Green Acres Mall and areas nearby. Two MTA New York City Transit bus routes also serve the station. Three traffic locations were analyzed: South Franklin Avenue and Sunrise Highway, South Franklin Avenue and Hawthorne Avenue, and Franklin Avenue and Merrick Road.

The *Port Jefferson* station is the eastern terminus of the Port Jefferson branch and is located along Main Street, the area's local shopping street. The station has 358 AM peak boardings. There are two parking lots at the station with 518 spaces, about 49 percent of which are occupied on a typical weekday. Four SCT bus routes serve the station. The traffic analysis locations for this station included Main Street at the station entrance, just north of Main Street's at-grade crossing of the LIRR tracks; and Main Street at North Country Road, two blocks north of the station.

The *Malverne* station on the West Hempstead branch has 524 AM peak boardings. It is located alongside Hempstead Avenue, which is a local shopping street in the business district, and a connecting street to West Hempstead to the north. Surface parking lots both east and west of the station provide 188 parking spaces, which are approximately 92 percent occupied. The station is served by one bus route, which links it with the Hempstead Transit Center. Two traffic intersections were analyzed, one on each side of the at-grade crossing of the LIRR tracks with Hempstead Avenue: Hempstead Avenue and Utterby Road, and Hempstead Avenue at the entrance to the station parking lot on the west side of the station.

Additional traffic analyses within this section include at-grade crossings of the LIRR tracks by local roads. Therefore, a representative set of at-grade crossings was also analyzed as part of this DEIS. Each grade crossing included in this analysis is located adjacent to a significantly utilized roadway or has been cited as a problem location under existing conditions. These locations included New Hyde Park Road (New Hyde Park), Robbins Lane (Syosset), Jackson Avenue (Syosset), and Franklin Avenue (Garden City). These are in addition to other at-grade crossing locations cited above—Willis Avenue in Mineola, Hempstead Avenue in Malverne, Main Street in Port Jefferson, and Executive Drive in Deer Park.

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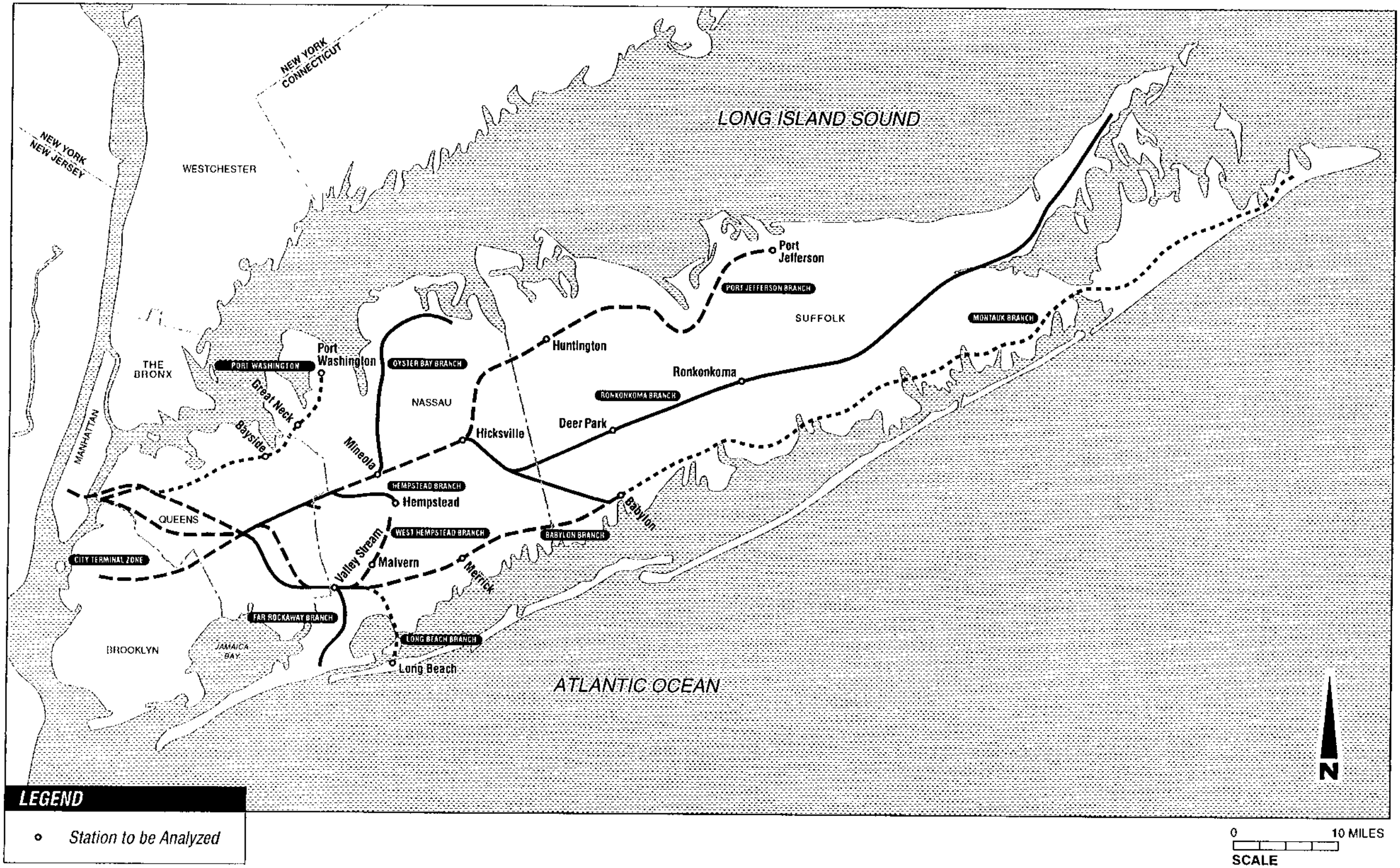

Figure 9E-1

Long Island Rail Road Station Analysis Locations

Table 9E-1
Existing Traffic Level of Service Summaries: Long Island Rail Road Station Areas

Intersection	AM Peak Hour		PM Peak Hour	
	LOS	Critical Movements with LOS E or F	LOS	Critical Movements with LOS E or F
Mineola				
Old Country Road and Mineola Boulevard/Franklin Avenue	D	—	C	—
Mineola Boulevard and 2nd Street	B	WB 2nd St and NB Mineola Boulevard lefts (LOS E)	C	WB 2nd Street (LOS E)
Hicksville				
Route 106 and West John Street	C	—	C	—
Route 106 and Duffy Avenue	C	—	D	SB Route 106 through (LOS E)
Route 107 and East John Street	C	NB Route 107 lefts (LOS E)	C	—
Woodbury Road and Bay Avenue/East Barclay Street	B	—	B	—
Huntington				
Route 110 and Broadway/Railroad Street	C	—	C	EB Railroad Street through/rights (LOS E)
Park Avenue and Broadway	B	NB Park Avenue lefts	B	—
Ronkonkoma				
Hawkins Avenue and LIE North Service Road	C	—	C	—
Hawkins Avenue and LIE South Service Road	C	—	C	—
Hawkins Avenue and Union Avenue	B	—	B	—
Ronkonkoma Avenue Ramp and Railroad Avenue	A	—	A	—
Babylon				
Deer Park Avenue and Park Avenue	B	—	B	—
Deer Park Avenue and Railroad Avenue	A	—	B	EB Railroad Avenue lefts (LOS E)
Deer Park Avenue and West Main Street	B	—	C	—
Great Neck				
Middle Neck Road and North Station Plaza	B	—	B	WB North Station Plaza lefts (LOS E)
Middle Neck Road and South Station Plaza	B	—	B	—
Port Washington				
Main Street and Port Washington Boulevard	C	NB Port Washington Boulevard lefts (LOS E) and EB Main Street lefts/through (LOS F)	B	EB Main Street lefts/through (LOS E)
Main Street and LIRR Station Entrance	A	—	A	—
Deer Park				
Executive Drive and Long Island Avenue	B	—	C	—
Executive Drive and Pine Aire Drive	C	—	C	—
Merrick				
Merrick Avenue and Sunrise Highway	D	WB Sunrise Highway throughs (LOS E)	C	—
Merrick Avenue and Broadcast Plaza	A	—	A	—
Merrick Avenue and Smith Street	C	—	C	—
Hempstead				
Main Street and West Columbia Street	B	—	B	—
Main Street and Fulton Street (Route 24)	B	—	B	—
Fulton Street (Route 24) and Washington Avenue	C	—	C	WB Fulton Street lefts/throughs (LOS E)
Long Beach				
West Park Avenue and Parking Lot Entrance	B	—	B	—
West Park Avenue and Center Street	B	—	B	—
West Park Avenue and Edwards Boulevard	B	—	B	—

Main Street, southeast of the station; and Deer Park Avenue and Railroad Avenue, at one of the unsignalized access points into the station's parking lot area.

The *Great Neck* station is a significantly used station on the Port Washington branch, with 2,989 AM peak boardings. This high usage is at least partially due to the 24-minute express commute into Penn Station characterizing several peak period trains. It is situated along Middle Neck Road in the heart of the Great Neck business district. There is very limited parking available near the station; its 360 parking spaces are 98.6 percent occupied. The station is served by five LI Bus routes. Two nearby intersections on either side of the station were analyzed in detail: the intersections of Middle Neck Road at North Station Plaza and at South Station Plaza.

The terminus of the Port Washington branch, *Port Washington* station, is located along Main Street, Port Washington's local retail street. The station has 2,429 boarding riders in the AM peak period. There are a total of 795 parking spaces at the station, which are 98 percent occupied on a typical weekday. Port Washington station is served by one LI Bus route. Traffic locations analyzed for this EIS included Main Street at the entrance to the station; and Main Street and Port Washington Boulevard, at the area's busiest traffic intersection, a few blocks east of the station.

The *Deer Park* station is located just two stops west of Ronkonkoma station and is characterized by AM peak boardings of 1,809 commuters. It is located in a generally open area just south of the recently developed Heartland Industrial Park. There are 1,061 parking spaces at the station, all situated on its north side between the station and Long Island Avenue. On a typical weekday, the parking lot is filled to more than 100 percent of its capacity. The station is served by five SCT bus routes. Access to station parking from the south side of the tracks is constrained by an at-grade crossing of the tracks at the east end of the station. Traffic analysis locations included Pine Aire Drive and Executive Drive, and Long Island Avenue and Executive Drive.

The *Merrick* station on the Babylon branch has 2,797 AM peak boardings. It is located on an elevated structure just north of Sunrise Highway and straddling Merrick Avenue, the main street within the Merrick business district. This station has the prototypical configuration for several stations along this branch. There are 1,563 parking spaces within the various surface parking lots surrounding the station on all sides; these parking spaces are more than 100 percent occupied on a typical weekday. The Merrick area is served by four bus routes, with one route stopping at the station. Three local intersections along Merrick Avenue were analyzed in detail: at Sunrise Highway, at Broadcast Plaza (the entrance to one of the station's primary parking lots), and at Smith Street located a few blocks to the north.

The *Hempstead* station is the eastern terminus on the Hempstead branch and is characterized by 800 westbound boardings in the AM peak as well as significant eastbound alightings. This is attributable to the station's location in the midst of the well-developed Hempstead business district and alongside a very active bus terminal, the Hempstead Transit Center, serving 20 LI Bus routes. This station, with its 896 surface parking spaces, has many access points, resulting in a good distribution of traffic into and out from the station area. Parking spaces at this station are 84 percent occupied on a typical weekday. Three key intersections near the station were analyzed in detail: Fulton and Main Streets; Fulton and Washington Streets; and Main and West Columbia Streets.

The *Long Beach* station has the highest ridership on the Long Beach branch with 1,631 AM peak boardings. There is also significant ridership at this station in the off-peak period from Long Beach's older resident population. The station and its parking lots are located along the

The average queue lengths are a function of a number of factors, e.g., the number of times the crossing gates are down because of LIRR trains passing through the area, the speed at which LIRR trains pass through the affected area (train speeds are generally slower at stations and, especially, at terminal stations), traffic volumes on the streets crossing the tracks, and the number of traffic lanes available within which stopped traffic can queue.

As shown in Table 9E-2, in the AM *auto* peak hour, the grade crossings at New Hyde Park Road and Willis Avenue on the Main Line have a high frequency of train crossings, with significant lost time at the crossing gates—82 and 102 seconds, respectively. At New Hyde Park Road, cross-street volumes are moderate (710 and 314 vph in the northbound and southbound directions, respectively) and the resulting queue lengths are more than eight vehicles north- and four southbound. At Willis Avenue in Mineola, average crossing gate delays are higher, but the queue lengths are somewhat lower due to much lower cross-street traffic volumes. Of the grade crossing locations analyzed, the crossing at Franklin Avenue has the highest volumes of cross-street traffic and consequently has one of the longest queues (more than 16 car lengths northbound). The LIRR crossings of Main Street in Port Jefferson and Hempstead Avenue in Malverne have the greatest stopped time delays in the AM peak hour. This is due primarily to much slower operating speeds for trains pulling into and out from these stations.

Table 9E-3 presents similar data for the peak *train* hour (i.e., the hour with the most LIRR trains crossing through the area). In a few cases the peak train hour and the peak auto hour are synonymous; in others they are not.

Table 9E-3

LIRR Grade Crossings: Existing Delays, Train Peak Hour

Location	Train Peak Hour	Volumes		Train Crossings	Average Delay at Gate (seconds)	Average Queues (in vehicles)	
		North-bound	South-bound			North-bound	South-bound
AM Peak Hour							
New Hyde Park Road (New Hyde Park)	8-9	710	314	15	82	8+	4
Willis Avenue (Mineola)	7:45-8:45	159	241	17	92	3	6
Franklin Avenue (Garden City)	7:45-8:45	1,180	646	6	92	16+	7
Robbins Lane (Syosset)	7-8	793	231	8	48	5	2
Jackson Avenue (Syosset)	7-8	379	368	8	145	13	17+
Main Street (Port Jefferson)	7:30-8:30	948	534	5	124	12+	11+
Hempstead Avenue (Malverne)	7-8	312	226	3	164	8	6
Executive Drive (Deer Park)	7-8	937*	252	4	64	21+*	4
PM Peak Hour							
New Hyde Park Road (New Hyde Park)	5-6	327	648	19	77	4	7
Willis Avenue (Mineola)	5:30-6:30	257	261	17	120	6	6
Franklin Avenue (Garden City)	5:45-6:45	679	959	7	100	10+	9+
Robbins Lane (Syosset)	5-6	363	1,194	10	50	3	8
Jackson Avenue (Syosset)	4:45-5:45	580	770	10	72	15+	18+
Main Street (Port Jefferson)	5:45-6:45	874	902	5	89	13+	11+
Hempstead Avenue (Malverne)	5-6	344	470	3	131	8	11
Executive Drive (Deer Park)	6-7	271*	706	5	118	8*	17+

Note: * Denotes right turn movement from WB Pine Aire Drive onto NB Executive Drive.

Overall, a set of 39 intersections and 8 at-grade crossing locations were analyzed for existing traffic conditions. Traffic counts were conducted for the AM and PM peak periods at all locations via a combination of manual counts and 24-hour Automatic Traffic Recorder (ATR) machine counts, and the specific peak traffic hours for each location were established (except for the Hicksville station area, where recent traffic count data was provided by the Town of Oyster Bay Department of Public Works (DPW) from its ongoing Hicksville Traffic Flow Study, and Merrick, where recent traffic count data was provided by the LIRR from its Merrick Area Revitalization Study).

For the intersection analyses, existing capacities, volume-to-capacity (v/c) ratios, average vehicle delays, and levels of service (LOS) were determined using the *1994 Highway Capacity Manual* procedures for each intersection approach and for the overall intersection.

Existing traffic conditions in each of the station areas studied encompass multiple traffic components—commuter traffic passing through the area on their way to work by car, LIRR commuters en route to the LIRR station either to park and ride from there or to pick up or drop off passengers and others (students or school buses in the AM peak period, shoppers in the PM peak period, etc.). At some of the station areas, there is a single pronounced traffic peak hour in the AM period and one in the PM period. At most locations, however, there are dual traffic peaks—the overall area's peak traffic hour and peak time periods when trains arrive at the station. These conditions vary area by area and by intersection within specific areas. For example, the traffic peak hour in the Great Neck study area is much more oriented to the commercial nature of the overall area; the resulting peak morning traffic hour is 8-9 AM. At other locations, particularly intersections right at entry points to a station's parking facilities, the peak hour may be more oriented to the specific train arrival and departure times. The existing traffic LOS analyses considered the traffic hour with the greatest potential for impact.

Overall, 39 intersections were analyzed at the 15 station areas studied, as shown in Table 9E-1. In the AM peak hours at the respective locations, 24 of 39 intersections operated at overall LOS A or B, 13 at LOS C, and 2 at LOS D. Although none of the intersections were determined to be operating at overall LOS E or F, 7 of the 39 intersections had at least one traffic movement at these unacceptable LOSs. In general, for the *overall* intersection to be at LOS E or F, either one particular traffic movement needs to be operating at extremely congested conditions or two or more traffic movements need to be at LOS E or F (the overall intersection LOS is a weighted average of all of the individual traffic movements).

In the PM peak hours, the LOS findings were very similar—24 of the 39 intersections operated at overall LOS A or B, 13 at LOS C, and 2 at LOS D. Although none of the intersections were at overall LOS E or F, 10 of the 39 intersections had at least one traffic movement at LOS E or F in the PM peak hour.

The analysis of traffic conditions also included eight significant grade crossing locations—i.e., where the LIRR tracks cross the street network at-grade and where local traffic must wait for a period of time for trains to pass. Table 9E-2 summarizes the findings of a survey of queue lengths and average time that traffic was stopped while the crossing gates were being activated or were in the down position at the eight locations during the peak auto traffic hour; train crossings reflect counts on the survey day.

Table 9E-4
Existing Parking Capacity and Utilization at LIRR Stations

Station	Off-Street Capacity	Off-Street Parking Usage	Utilization (percent)	Parked On-Street
Babylon Branch				
Rockville Centre	1,419	1,383	97.5	100
Baldwin	1,266	1,222	96.5	286
Freeport	1,152	767	66.6	97
Merrick	1,563	1,628	104.2	160
Bellmore	1,573	1,615	102.7	14
Wantagh	1,508	1,547	102.6	50
Seaford	1,148	1,163	101.3	0
Massapequa	1,798	1,791	99.6	153
Massapequa Park	723	701	97.0	58
Amityville	625	501	80.2	0
Copiague	742	767	103.4	93
Lindenhurst	790	675	85.4	160
Babylon	2,026	1,701	84.0	37
Branch Total	*16,333*	*15,461*	*94.7*	*1,208*
Ronkonkoma Branch				
Bethpage	889	922	103.7	100
Farmingdale	507	536	105.7	50
Pinelawn	N/A	N/A	N/A	N/A
Wyandanch	960	1,039	108.2	26
Deer Park	1,061	1,457	137.3	254
Brentwood	871	596	68.4	33
Central Islip	922	1,144	124.1	0
Ronkonkoma	4,998	5,395	107.9	167
Holtsville	N/A	N/A	N/A	N/A
Medford	20	7	35.0	0
Yaphank	42	2	4.8	0
Riverhead	22	17	77.3	0
Mattituck	71	32	45.1	0
Southold	20	1	5.0	0
Greenport	99	49	49.5	0
Branch Total	*10,482*	*11,197*	*106.8*	*630*
Hempstead Branch				
Hollis	N/A	N/A	N/A	N/A
Queens Village	87	62	71.3	0
Bellerose	37	37	100.0	0
Floral Park	636	532	83.6	29
Stewart Manor	157	142	90.4	0
Nassau Boulevard	249	246	98.8	0
Garden City	373	369	98.9	19
Country Life Press	417	135	32.4	0
Hempstead	896	756	84.4	0
Branch Total	*2,852*	*2,279*	*79.9*	*48*
Far Rockaway Branch				
Locust Manor	0	0	—	22
Laurelton	52	52	100.0	10
Rosedale	211	45	21.3	130

Table 9E-1 (Continued)

Existing Traffic Level of Service Summaries: Long Island Rail Road Station Areas

Intersection	AM Peak Hour		PM Peak Hour	
	LOS	Critical Movements with LOS E or F	LOS	Critical Movements with LOS E or F
Bayside				
Bell Boulevard and Northern Boulevard	B	NB Bell Boulevard (LOS E)	B	NB Bell Boulevard (LOS E)
Bell Boulevard and 41st Avenue	C	—	B	—
Valley Stream				
South Franklin Avenue and Sunrise Highway	B	SB Franklin Avenue lefts (LOS E)	B	SB Franklin Avenue lefts (LOS E)
South Franklin Avenue and West Hawthorne Avenue	B	—	B	—
South Franklin Avenue and Merrick Road	B	—	B	—
Port Jefferson				
Main Street (Route 25A) and LIRR Entrance	A	—	A	—
Main Street (Route 25A) and North Country Road	C	—	D	SB Main Street lefts (LOS F)
Malverne				
Hempstead Avenue and Utterby Road	C	—	B	—
Hempstead Avenue/Francis Street/LIRR Entrance	B	—	B	—

Table 9E-2

LIRR Grade Crossings: Existing Delays, Auto Peak Hour

Location	Auto Peak Hour	Volumes		Train Crossings	Average Delay at Gate (seconds)	Average Queues (in vehicles)	
		North-bound	South-bound			North-bound	South-bound
AM Peak Hour							
New Hyde Park Road (New Hyde Park)	8-9	710	314	15	82	8+	4
Willis Avenue (Mineola)	8-9	162	270	15	102	4	6
Franklin Avenue (Garden City)	8-9	1,271	668	5	90	16+	7
Robbins Lane (Syosset)	8-9	1,042	348	6	45	5	2
Jackson Avenue (Syosset)	8-9	549	537	5	109	14+	17+
Main Street (Port Jefferson)	7:30-8:30	948	534	5	124	12+	11+
Hempstead Avenue (Malverne)	8-9	421	387	2	133	9	9
Executive Drive (Deer Park)	7:30-8:30	960*	309	3	63	20+*	3
PM Peak Hour							
New Hyde Park Road (New Hyde Park)	4:45-5:45	374	676	18	77	4	7
Willis Avenue (Mineola)	5:15-6:15	276	276	15	124	6	6
Franklin Avenue (Garden City)	4:30-5:30	945	1,358	2	99	11	9
Robbins Lane (Syosset)	4:45-5:45	377	1,201	9	49	2	7
Jackson Avenue (Syosset)	4:45-5:45	580	770	10	72	15+	18+
Main Street (Port Jefferson)	5-6	915	1,082	2	94	13	11
Hempstead Avenue (Malverne)	4:30-5:30	394	542	2	120	8	10
Executive Drive (Deer Park)	4:45-5:45	349*	820	4	122	11*	20+

Note: * Denotes right turn movement from WB Pine Aire Drive onto NB Executive Drive.

Table 9E-4 (Continued)
Existing Parking Capacity and Utilization at LIRR Stations

Station	Off-Street Capacity	Off-Street Parking Usage	Utilization (percent)	Parked On-Street
Port Jefferson Branch (cont'd)				
Carle Place	14	44	314.3	20
Westbury	577	563	97.6	157
Hicksville	3,328	3,331	100.1	120
Syosset	1,221	1,235	101.1	118
Cold Spring Harbor	969	945	97.5	0
Huntington	3,820	3,636	95.2	266
Greenlawn	435	239	54.9	0
Northport	1,046	623	59.6	0
Kings Park	771	564	73.2	12
Smithtown	794	338	42.6	0
St. James	312	163	52.2	0
Stony Brook	444	313	70.5	0
Port Jefferson	518	252	48.6	0
Branch Total	*15,617*	*13,547*	*86.7*	*1,082*
Oyster Bay Branch				
East Williston	201	192	95.5	50
Albertson	77	21	27.3	61
Roslyn	336	226	67.3	61
Greenvale	190	69	36.3	13
Glen Head	168	116	69.0	10
Sea Cliff	133	96	72.2	0
Glen Street	132	84	63.6	0
Glen Cove	161	122	75.8	0
Locust Valley	187	185	98.9	0
Mill Neck	N/A	N/A	N/A	N/A
Oyster Bay	338	35	10.4	0
Branch Total	*1,923*	*1,146*	*59.6*	*195*
West Hempstead Branch				
St. Albans	N/A	N/A	N/A	N/A
Westwood	62	44	71.0	0
Malverne	188	173	92.0	0
Lakeview	55	52	94.5	18
Hempstead Gardens	0	0	N/A	52
West Hempstead	980	384	39.2	0
Branch Total	*1,285*	*653*	*50.8*	*70*
Long Beach Branch				
Lynbrook	940	677	72.0	91
Centre Avenue	116	88	75.9	6
East Rockaway	169	167	98.8	0
Oceanside	561	562	100.2	67
Island Park	466	458	98.3	0
Long Beach	223	200	89.7	262
Branch Total	*2,475*	*2,152*	*86.9*	*426*

Parking

Detailed information on capacity and parking utilization is available from LIRR databases for all stations in its system. This information is summarized in Table 9E-4 on a branch-by-branch basis. It is apparent from a review of the data that most stations are operating with parking lots and garages at much greater than 90 percent utilization levels; several are operating at levels very close to, if not greater than, 100 percent.

As indicated in Table 9E-4, the Babylon and Port Jefferson branches offer the largest number of parking spaces, with 16,333 and 15,617 spaces, respectively. The parking lots at almost half of the stations along the Babylon branch are utilized at more than 100 percent of capacity, with the branch as a whole having close to 95 percent of its total supply of parking utilized. Ronkonkoma branch parking supply is more than 100 percent utilized, including six stations with greater than 100 percent utilization levels. The Port Washington branch parking supply is 95 percent occupied; several stations in Eastern Queens have substantial levels of on-street parking (Broadway, Auburndale, Bayside, Douglaston, and Little Neck), but have very limited amounts of parking provided in lots.

The parking lots along several other branches are relatively lightly used. The West Hempstead and Montauk branches have a 50 percent utilization level overall, and the Oyster Bay branch has a 60 percent utilization level. The Far Rockaway and Hempstead branches have 80 percent utilization levels overall and the Long Beach branch has 87 percent.

The 15 stations analyzed in detail in this DEIS include the four stations with the largest amount of station parking provided. These include Ronkonkoma, Huntington, Hicksville, and Babylon, which collectively have about 97 percent of their station parking spaces filled on a typical commutation day. As shown in Table 9E-4, several of the 15 analysis stations currently have parking utilization levels approaching, at, or greater than 100 percent, or have significant on-street parking levels due to the small or insufficient amount of parking currently in existence at the station itself.

FUTURE CONDITIONS COMMON TO ALL ALTERNATIVES

In determining traffic volumes at the various LIRR station study area intersections in the future, baseline background traffic growth rates were applied to existing traffic volumes. For Nassau County, a 0.75 percent per year traffic growth rate was used, as suggested by the Traffic Engineering Director's Office of the Nassau County DPW; for western Suffolk County, 2 percent growth per year was assumed, as suggested by the Suffolk County DPW (there were no analysis locations in eastern Suffolk County). Compounded annually, these growth rates would produce an overall traffic growth of about 9 percent at analysis locations in Nassau County and about 27 percent in Suffolk County.

For traffic impact analyses within Nassau and Suffolk Counties, the generally accepted practice on Long Island is to define significant impacts as any degradation in an LOS (e.g., LOS D to E), including even degradation from LOS A to B or C (even though this can be qualified as still being within acceptable conditions). For the purposes of this DEIS, deterioration from LOS A to B, and from LOS A or B to C were not considered significant impacts requiring mitigation, since they would still be within acceptable flow conditions, but deterioration from LOS C to D was considered significant. In Nassau and Suffolk Counties, deterioration from LOS F to F* would be considered a significant impact, as would significant deterioration within LOS E or F (although this is subjective, depending on the judgement of the reviewing agency). For the

The conclusions are not surprising given a steady traffic growth rate accumulating to a substantial overall growth percentage to the 2010 analysis year.

The detailed intersection-by-intersection LOS analysis findings are presented in Table 9E-6. It is also apparent from Table 9E-6 that many of the intersections expected to be operating at unacceptable LOS E or F conditions would be characterized by extreme delays, as indicated by the LOS F* resulting from the detailed capacity analysis.

Traffic conditions at the eight grade crossing analysis locations were modeled under the future No Action Alternative. This analysis assumed that the number of trains crossing at each location would remain the same as under existing conditions and that traffic volumes would increase according to background growth rates. The findings are shown in Table 9E-7 and discussed below.

In the AM peak hour, the average maximum queues of vehicles waiting to cross the LIRR tracks while the crossing gates are activated would generally increase by two vehicles or fewer, except at one location. At Port Jefferson station, vehicle queues along north- and southbound Main Street would increase by an estimated seven and five vehicles, respectively. The delay time to the "average" vehicle crossing the tracks at the eight analysis locations would be 2 seconds or less, except for westbound Pine Aire Drive traffic approaching Executive Drive and the LIRR crossing at Deer Park station, which would experience delay increases of about 4 seconds. This condition would not be considered a significant impact to motorists, assuming that the 10 seconds of additional delay threshold used to identify significant impacts for signalized intersections are applied to at-grade crossing locations as well.

In the PM peak hour, the average maximum queues of vehicles waiting to cross the LIRR tracks while the crossing gates have been activated would generally increase by two vehicles or fewer, except for the following three locations: at Port Jefferson station, vehicle queues along north- and southbound Main Street would increase by an estimated 6 and 7 vehicles, respectively; at Syosset station, north- and southbound queues along Main Street are estimated to increase by 2 and 3 vehicles, respectively; and at Deer Park station, westbound queues along Pine Aire Drive and southbound queues along Executive Drive are estimated to increase by 3 and 5 vehicles, respectively. The delay time to the "average" vehicle crossing the tracks at the eight analysis locations would be 2 seconds or less, except for southbound Executive Drive approaching the LIRR crossing at Deer Park station. Vehicles here would experience delay increases of about 7 seconds. This condition would not be considered a significant impact to motorists (assuming that 10 seconds of additional delay is the threshold for significant impact), but it approaches the threshold of one.

Parking

For the evaluation of station parking conditions under the No Action Alternative, LIRR ridership growth projections were compared with parking supply increases anticipated by LIRR without the Preferred Alternative.

No Action parking conditions in the year 2010 were determined using LIRR ridership projections that estimated the volume of new riders generated at each station and assume modal splits and average vehicle occupancy rates similar to existing conditions. This analysis identified the following ridership growth factors branch-by-branch:

Table 9E-4 (Continued)
Existing Parking Capacity and Utilization at LIRR Stations

Station	Off-Street Capacity	Off-Street Parking Usage	Utilization (percent)	Parked On-Street
Far Rockaway Branch (continued)				
Valley Stream	1,285	1,063	82.7	43
Gibson	71	68	95.8	20
Hewlett	815	889	109.1	19
Woodmere	291	284	97.6	400
Cedarhurst	797	626	78.5	30
Lawrence	201	113	56.2	30
Inwood	212	105	49.5	0
Far Rockaway	150	1	0.7	0
Branch Total	*4,085*	*3,246*	*79.5*	*704*
Montauk Branch				
Bay Shore	449	294	65.5	0
Islip	395	185	46.8	0
Great River	91	59	64.8	0
Oakdale	246	97	39.4	0
Sayville	485	358	73.8	0
Patchogue	594	274	46.1	0
Bellport	35	0	0.0	0
Center Moriches	N/A	N/A	N/A	N/A
Mastic-Shirley	195	124	63.6	0
Speonk	180	97	53.9	1
Westhampton	38	8	21.1	0
Quogue	N/A	N/A	N/A	N/A
Hampton Bays	190	30	15.8	0
Southampton	74	44	59.5	0
Southampton Campus	N/A	N/A	N/A	N/A
Bridgehampton	85	50	58.8	0
East Hampton	373	103	27.6	18
Amagansett	35	20	57.1	0
Montauk	60	3	5.0	0
Branch Total	*3,525*	*1,746*	*49.5*	*19*
Port Washington Branch				
Flushing	572	572	100.0	0
Murray Hill	0	0	N/A	315
Broadway	79	90	113.9	665
Auburndale	0	0	N/A	839
Bayside	75	48	64.0	999
Douglaston	118	119	100.8	500
Little Neck	113	111	98.2	400
Great Neck	360	355	98.6	0
Manhasset	496	491	99.0	0
Plandome	255	169	66.3	0
Port Washington	795	775	97.5	0
Branch Total	*2,863*	*2,730*	*95.4*	*3,718*
Port Jefferson Branch				
New Hyde Park	651	586	90.0	76
Merillon Avenue	153	167	109.2	0
Mineola	564	548	97.2	313

Table 9E-6 (Continued)
No Action Traffic Level of Service Summaries Long Island Rail Road Station Areas

Intersection	AM Peak Hour		PM Peak Hour	
	LOS	Critical Movements with LOS E or F	LOS	Critical Movements with LOS E or F
Deer Park				
Executive Drive and Long Island Avenue	B	—	D	SB Executive Drive throughs and WB Long Island Avenue lefts (LOS E)
Executive Drive and Pine Aire Drive	F*	WB Pine Aire Drive rights (LOS F*)	D	SB Executive Drive and WB Pine Aire Drive lefts/throughs (LOS E)
Merrick				
Merrick Avenue and Sunrise Highway	F*	WB Sunrise Highway through (LOS F*)	D	SB Merrick Avenue lefts (LOS F)
Merrick Avenue and Broadcast Plaza	A	—	A	—
Merrick Avenue and Smith Street	D	SB Merrick Avenue throughs/rights (LOS E)	F*	NB Merrick Avenue throughs/rights (LOS F*)
Hempstead				
Main Street and West Columbia Street	B	—	B	—
Main Street and Fulton Street (Route 24)	B	—	B	SB Main Street (LOS E)
Fulton Street (Route 24) and Washington Avenue	F*	EB Fulton Street lefts (LOS E) and WB Fulton Street left/throughs (F*)	F*	WB Fulton Street lefts/throughs (LOS F*)
Long Beach				
West Park Avenue and Parking Lot Entrance	B	—	B	—
West Park Avenue and Center Street	B	—	B	—
West Park Avenue and Edwards Boulevard	B	—	B	—
Bayside				
Bell Boulevard and Northern Boulevard	F*	NB Bell Boulevard (LOS F*)	C	NB Bell Boulevard (LOS E)
Bell Boulevard and 41st Avenue	D	NB Bell Boulevard (LOS F)	D	NB Bell Boulevard (LOS E)
Valley Stream				
South Franklin Avenue and Sunrise Highway	B	SB South Franklin Avenue lefts (LOS E)	B	SB South Franklin Avenue lefts (LOS F)
South Franklin Avenue and West Hawthorne Avenue	B	—	B	—
South Franklin Avenue and Merrick Road	B	—	C	—
Port Jefferson				
Main Street (Route 25A) and LIRR Entrance	A	—	B	NB Main St. lefts
Main Street (Route 25A) and North Country Road	F*	NB Main Street and WB North Country Road lefts (LOS F*)	F*	SB Main Street lefts, NB Main Street (LOS F*) and WB North Country Road lefts (LOS F*) and EB North Country Road (LOS E)
Malverne				
Hempstead Avenue and Utterby Road	C	—	B	—
Hempstead Ave./Francis St./LIRR Entrance	C	—	C	—

purposes of this DEIS, deterioration within LOS E or F (including deterioration from LOS F to F*) was considered significant if it included delay increases of 10 seconds or more (thus following the criteria cited previously for intersection analyses in New York City).

The detailed traffic analyses that follow focus on year 2010 conditions, since that is a realistic time frame for predicting traffic growth with and without the Preferred Alternative. It is substantially more difficult to predict background traffic growth rates and conditions at local intersections so far in the future, let alone the impacts of the Preferred Alternative in 20 years. At the rates assumed in the year 2010 analyses, 20 years of background traffic growth would produce congested LOS E or F conditions at numerous, if not all, traffic analysis locations examined in this EIS. Undoubtedly, local agencies responsible for traffic engineering functions would implement measures to mitigate those impacts, but it is highly conjectural to assume what they would be; it would also be unrealistic to assume that no improvements would be in place. In addition, the volume of vehicle trips generated by the Preferred Alternative over No Action conditions in the year 2020 is only negligibly higher than its counterpart in the year 2010.

PROBABLE IMPACTS OF PROJECT ALTERNATIVES

NO ACTION ALTERNATIVE

Traffic

As shown in Table 9E-5, overall, under the future No Action Alternative, 16 of the 39 intersections would operate at overall LOS A or B in the AM peak hour, 6 would be at LOS C, 6 at LOS D, and 11 at overall LOS E or F. This represents a substantial deterioration from existing traffic conditions, characterized by two intersections at overall LOS D and none at LOS E or F. The analysis also indicates that 22 of the 39 intersections would have at least one traffic movement at an unacceptable LOS E or F, as opposed to 7 intersections with similar characteristics under existing conditions.

Table 9E-5

Traffic Level of Service Summary Comparison: Existing vs. Future No Action Alternative

	Existing Peak Hour		No Action Peak Hour	
	AM	PM	AM	PM
Intersections @ Overall LOS A/B	23	24	16	13
Intersections @ Overall LOS C	14	13	6	10
Intersections @ Overall LOS D	2	2	6	6
Intersections @ Overall LOS E/F	0	0	11	10
Intersections with Movements at LOS E or F	7	10	22	24

In the PM peak hour, the LOS findings were very similar—13 of the 39 intersections would operate at overall LOS A or B, 10 at LOS C, 6 at LOS D, and 10 at overall LOS E or F, as opposed to just 2 intersections operating at overall LOS D conditions and currently none at LOS E or F conditions. Under the future No Action Alternative, 24 of the 39 intersections would have at least one traffic movement at LOS E or F in the PM peak hour, as opposed to just 10 intersections having similar characteristics under existing conditions.

A detailed station-by-station parking space utilization comparison is presented in Table 9E-8. As shown, numerous LIRR stations can be expected to experience significant parking shortfalls in the No Action Alternative. The number of stations experiencing parking utilization rates in excess of 100 percent can be expected to more than double, increasing from the current 22 to 51 stations in the No Action Alternative. Three branches—Babylon, Port Jefferson, and Ronkonkoma—would experience overall parking utilization conditions that would increase from current rates less than 100 percent to future No Action rates in excess of 100 percent. This would occur even with the expected parking increase improvements.

PREFERRED ALTERNATIVE

Traffic

Traffic impacts of the Preferred Alternative are related to the number of new riders projected to use each LIRR station; specifically, the number of auto trips that these new riders would generate. The volume of new riders that would drive or be dropped off/picked up by car or taxi (modal split) was determined using projected LIRR ridership growth percentages and modal split data for each of the 15 analysis stations. This analysis identified the following ridership growth factors that can be expected for each branch in addition to the growth expected in the No Action conditions (as outlined above):

Babylon	+ 5.7%
Far Rockaway	+ 5.4%
Hempstead	+19.0%
Long Beach	+ 3.7%
Montauk	+ 1.2%
Oyster Bay	+ 0.5%
Port Jefferson	+ 4.1%
Port Washington	+20.8%
Ronkonkoma	+12.6%
West Hempstead	+20.4%

The modal splits for vehicle traffic ranged from 32 percent by auto at Malverne; 43 to 48 percent by auto at Bayside, Long Beach, and Great Neck; to 95 to 99 percent at Huntington, Deer Park, and Ronkonkoma. At most of the remaining stations, about 80 to 90 percent of their riders arrive by auto, most of which park at the station; many others are dropped off by someone else.

Average vehicle occupancy rates were then established by survey for a sample set of stations, and indicated that the average auto occupancy at Long Island stations was 1.08. Therefore, the vast majority of cars parked at Long Island stations or used to drop off riders had just one commuter in them. The small number of vehicles with two or more commuters raised the average to 1.08.

Based on this trip generation, modal split, and average vehicle occupancy information, the volume of vehicle traffic that is expected to be generated by the Preferred Alternative was determined for each of the 15 analysis stations (see Table 9E-9). Vehicle pick-ups or drop-offs are counted as two vehicle "trips" to reflect that each car or taxi coming to drop off a rider is both an arriving and departing vehicle trip.

Table 9E-6
No Action Traffic Level of Service Summaries Long Island Rail Road Station Areas

Intersection	AM Peak Hour		PM Peak Hour	
	LOS	Critical Movements with LOS E or F	LOS	Critical Movements with LOS E or F
Old Country Road and Mineola Boulevard/Franklin Avenue	D	SB Mineola Boulevard lefts, NB Mineola Boulevard, Old Country Road EB throughs/rights (LOS E)	F*	NB Mineola Boulevard throughs/right (LOS F*) and WB Old Country Road lefts (LOS E)
Mineola Boulevard and 2nd Street	F*	WB 2nd St and NB Mineola Boulevard lefts (LOS F*)	F*	WB 2nd Street (LOS F*) and SB Mineola Boulevard (LOS E) and through/rights (LOS F*)
Hicksville				
Route 106 and West John Street	C	NB Route 106 lefts (LOS E)	F*	EB West John Street lefts (LOS F*) and SB Route 106 lefts (LOS E)
Route 106 and Duffy Avenue	D	WB Duffy Avenue and SB Route 106 rights (LOS E)	F*	SB Route 106 throughs (LOS F*), WB Duffy Avenue (LOS E) and EB Duffy Avenue lefts (LOS E)
Route 107 and East John Street	C	NB Route 107 lefts (LOS E)	C	—
Woodbury Road and Bay Avenue/East Barclay Street	B	—	B	—
Huntington				
Route 110 and Broadway/Railroad Street	C	EB Railroad Street throughs /rights (LOS E) and lefts (LOS F)	F*	EB Railroad Street throughs/rights and SB Route 110 lefts (LOS F*)
Park Avenue and Broadway	F*	NB Park Avenue lefts (LOS F*)	C	EB Broadway lefts (LOS F)
Ronkonkoma				
Hawkins Avenue and LIE North Service Road	D	NB Hawkins Avenue lefts (LOS E)	C	—
Hawkins Avenue and LIE South Service Road	D	SB Hawkins Avenue lefts (LOS F)	C	NB Hawkins Avenue throughs/rights (LOS F)
Hawkins Avenue and Union Avenue	B	—	C	SB Hawkins Avenue lefts (LOS E)
Ronkonkoma Avenue Ramp and Railroad Avenue	A	—	A	—
Babylon				
Deer Park Avenue and Park Avenue	F*	SB Deer Park Avenue (LOS F*)	D	SB Deer Park Avenue (LOS E)
Deer Park Avenue and Railroad Avenue	B	EB Railroad Avenue lefts (LOS E)	D	EB Railroad Avenue lefts (LOS F)
Deer Park Avenue and West Main Street	C	—	F*	NB Fire Island Avenue (LOS F*) and SB Deer Park Avenue (LOS F)
Great Neck				
Middle Neck Road and North Station Plaza	F*	NB Middle Neck Road lefts (LOS F*)	F*	WB North Station Plaza lefts (LOS F*)
Middle Neck Road and South Station Plaza	F*	NB Middle Neck Road lefts (LOS F*) and EB South Station Plaza lefts (LOS E)	C	—
Port Washington				
Main Street and Port Washington Boulevard	F*	NB Port Washington Boulevard lefts and EB Main Street lefts/throughs (LOS F*)	C	EB Main Street lefts/throughs and WB Main Street (LOS F)
Main Street and LIRR Station Entrance	A	—	A	—

Table 9E-8 (Continued)
No Action Parking Capacity and Utilization at LIRR Stations

Station	Off-Street Capacity	Off-Street Parking Usage	Utilization (percent)	Parked On-Street
Far Rockaway Branch (continued)				
Gibson	71	76	107.3	22
Hewlett	815	996	122.2	21
Woodmere	306	318	103.9	448
Cedarhurst	797	701	88.0	34
Lawrence	201	127	63.0	34
Inwood	212	118	55.5	0
Far Rockaway	150	1	0.7	0
Branch Total	*4,330*	*3,636*	*84.0*	*789*
Montauk Branch				
Bay Shore	499	482	96.6	0
Islip	445	303	68.2	0
Great River	121	97	80.0	0
Oakdale	271	159	58.7	0
Sayville	535	587	109.7	0
Patchogue	653	449	68.8	0
Bellport	35	0	0.0	0
Center Moriches	N/A	N/A	N/A	N/A
Mastic-Shirley	195	203	104.3	0
Speonk	305	159	52.2	2
Westhampton	88	13	14.9	0
Quogue	N/A	N/A	N/A	N/A
Hampton Bays	190	49	25.9	0
Southampton	99	72	72.9	0
Southampton Campus	N/A	N/A	N/A	N/A
Bridgehampton	85	82	96.5	0
East Hampton	373	169	45.3	30
Amagansett	35	33	93.7	0
Montauk	60	5	8.2	0
Branch Total	*3,989*	*2,863*	*71.8*	*32*
Port Washington Branch				
Flushing	572	591	103.4	0
Murray Hill	0	0	N/A	326
Broadway	79	93	117.8	688
Auburndale	0	0	N/A	868
Bayside	75	50	66.2	1,033
Douglaston	118	123	104.3	517
Little Neck	113	115	101.6	414
Great Neck	360	367	102.0	0
Manhasset	496	508	102.4	0
Plandome	255	175	68.5	0
Port Washington	795	801	100.8	0
Branch Total	*2,863*	*2,823*	*98.6*	*3,844*
Port Jefferson Branch				
New Hyde Park	651	783	120.3	102
Merillon Avenue	153	223	145.8	0
Mineola	564	732	129.8	418
Carle Place	14	59	419.9	27

Table 9E-7

LIRR Grade Crossing Impacts: No Action Alternative vs. Existing Conditions

Location	Additional Train Crossings	Additional Queue Length (vehicles)		Additional Stopped Time at the Gate	
		NB	SB	NB	SB
AM Peak Hour					
New Hyde Park Road (New Hyde Park)**	0	+2	0	—*	—
Willis Avenue (Mineola)	0	0	+1	—	—
Franklin Avenue (Garden City)	0	+2	+1	—	—
Robbins Lane (Syosset)	0	+2	0	—	—
Jackson Avenue (Syosset)	0	+2	+1	—	—
Main Street (Port Jefferson)	0	+7	+5	—	—
Hempstead Avenue (Malverne)	0	+2	0	—	—
Executive Drive (Deer Park)	0	EB +2 WB +2	SB 0	EB — WB 4 sec.	SB —
PM Peak Hour					
New Hyde Park Road (New Hyde Park)**	0	+1	+1	—*	—
Willis Avenue (Mineola)	0	+1	+1	—	—
Franklin Avenue (Garden City)	0	+1	+2	—	—
Robbins Lane (Syosset)	0	+1	+1	—	—
Jackson Avenue (Syosset)	0	+2	+3	—	2 sec.
Main Street (Port Jefferson)	0	+6	+7	—	—
Hempstead Avenue (Malverne)	0	+1	+2	—	—
Executive Drive (Deer Park)	0	EB +1 WB +3	SB +5	EB — WB —	SB 7 sec.

Notes:

* — = Negligible, i.e., under 2 seconds.

** These grade crossings may be eliminated in conjunction with the Main Line Third Track Project.

Babylon	+19.3%
Far Rockaway	+12.0%
Hempstead	+ 4.0%
Long Beach	+17.2%
Montauk	+64.0%
Oyster Bay	+50.6%
Port Jefferson	+33.6%
Port Washington	+ 3.4%
Ronkonkoma	+31.0%
West Hempstead	+26.2%

LIRR anticipates parking increases at 28 LIRR stations, ranging from fewer than 10 spaces at some stations to as many as 300 or more spaces at others. Major increases are currently programmed at Bellmore (250 spaces), Deer Park (300 spaces), Farmingdale (357 spaces), Lindenhurst (118 spaces), Lynbrook (100 spaces), Port Jefferson (160 spaces), Speonk (125 spaces), and Valley Stream (230 spaces). Overall, an increase of 2,382 parking spaces are currently planned to be added (excluding additional spaces that may be created at stations currently under study, but which are not yet planned).

Table 9E-9
Vehicle Trips Generated at LIRR Stations by the East Side Access Project (AM Peak Hour)

Station	Vehicle Trips Parking at Station	Vehicle Pick-up or Drop-off Trips	Total Generated Vehicle Trips
Bayside	95	47 x 2 = 94	189
Great Neck	90	43 x 2 = 86	176
Port Washington	111	41 x 2 = 82	193
Mineola	10	3 x 2 = 6	16
Hicksville	106	13 x 2 = 26	132
Huntington	78	6 x 2 = 12	90
Port Jefferson	2	1 x 2 = 2	4
Long Beach	6	1 x 2 = 2	8
Hempstead	24	6 x 2 = 12	36
Malverne	3	1 x 2 = 2	5
Valley Stream	19	4 x 2 = 8	27
Merrick	29	4 x 2 = 8	37
Babylon	44	14 x 2 = 28	72
Deer Park	52	6 x 2 = 12	64
Ronkonkoma	228	21 x 2 = 42	270

The vehicle trips expected to be generated at each of these 15 LIRR stations were then assigned to the local street network to determine future (with the Preferred Alternative) traffic LOSs and the potential for significant traffic impacts at the 15 "test" stations. An overview comparison of future No Action and Preferred Alternatives is shown in Table 9E-10.

Table 9E-10
Traffic Level of Service Summary Comparison: Preferred vs. No Action Alternative

	No Action Peak Hour		Preferred Alternative Peak Hour	
	AM	PM	AM	PM
Intersections @ Overall LOS A/B	16	13	16	13
Intersections @ Overall LOS C	6	10	6	7
Intersections @ Overall LOS D	6	6	5	5
Intersections @ Overall LOS E/F	11	10	12	14
Intersections with Movements at LOS E or F	22	24	22	25
Intersections with Significant Traffic Impacts	N/A	NA	11	13

Overall, the Preferred Alternative can be expected to create significant traffic impacts at 11 of the 39 intersections analyzed in the AM peak hour and at 13 intersections in the PM peak hour. Table 9E-10 indicates that, for the most part, intersections expected to operate at clearly acceptable LOSs A, B or C would generally continue to operate at similar LOSs. Several intersections operating at marginally acceptable/unacceptable LOS D under the No Action Alternative would deteriorate into unacceptable LOS E or F. Some intersections would experience significantly

Table 9E-8

No Action Parking Capacity and Utilization at LIRR Stations

Station	Off-Street Capacity	Off-Street Parking Usage	Utilization (percent)	Parked On-Street
Babylon Branch				
Rockville Centre	1,419	1,650	116.3	119
Baldwin	1,302	1,458	112.0	341
Freeport	1,152	915	79.4	116
Merrick	1,563	1,942	124.3	191
Bellmore	1,823	1,927	105.7	17
Wantagh	1,508	1,846	122.4	60
Seaford	1,148	1,387	120.9	0
Massapequa	1,798	2,137	118.8	183
Massapequa Park	723	836	115.7	69
Amityville	625	598	95.6	0
Copiague	742	915	123.3	111
Lindenhurst	908	805	88.7	191
Babylon	2,043	2,029	99.3	44
Branch Total	*16,754*	*18,445*	*110.1*	*1,441*
Ronkonkoma Branch				
Bethpage	889	1,208	135.9	131
Farmingdale	845	702	83.1	66
Pinelawn	N/A	N/A	N/A	N/A
Wyandanch	1,011	1,361	134.6	34
Deer Park	1,361	1,909	140.2	333
Brentwood	871	781	89.6	43
Central Islip	922	1,499	162.5	0
Ronkonkoma	4,998	7,067	141.4	219
Holtsville	N/A	N/A	N/A	N/A
Medford	20	9	45.9	0
Yaphank	42	3	6.2	0
Riverhead	22	22	101.2	0
Mattituck	71	42	59.0	0
Southold	20	1	6.6	0
Greenport	99	64	64.8	0
Branch Total	*11,171*	*14,668*	*131.3*	*826*
Hempstead Branch				
Hollis	N/A	N/A	N/A	N/A
Queens Village	87	64	74.1	0
Bellerose	42	38	91.6	0
Floral Park	636	553	87.0	30
Stewart Manor	157	148	94.1	0
Nassau Boulevard	249	256	102.7	0
Garden City	373	384	102.9	20
Country Life Press	417	140	33.7	0
Hempstead	896	786	87.8	0
Branch Total	*2,857*	*2,370*	*83.0*	*50*
Far Rockaway Branch				
Locust Manor	0	0	N/A	25
Laurelton	52	58	112.0	11
Rosedale	211	50	23.9	146
Valley Stream	1,515	1,191	78.6	48

Table 9E-11
Preferred Alternative Traffic Level of Service and Significant Impact Summaries: Long Island Rail Road Station Areas

	AM Peak Hour			PM Peak Hour		
Intersection	LOS	Critical Movements with LOS E or F	Signif. Impact	LOS	Critical Movements with LOS E or F	Signif. Impact
Mineola						
Old Country Road and Mineola Boulevard/Franklin Avenue	D	SB Mineola Boulevard lefts, NB Mineola Boulevard, Old Country Road EB throughs/rights (LOS E)	—	F*	NB Mineola Boulevard throughs/right (LOS F*) and WB Old Country Road lefts (LOS E)	—
Mineola Boulevard and 2nd Street	F*	WB 2nd Street and NB Mineola Boulevard lefts (LOS F*)	—	F*	WB 2nd Street (LOS F*) and SB Mineola Boulevard lefts (LOS E) and through/rights (LOS F*)	—
Hicksville						
Route 106 and West John Street	C	NB Route 106 lefts (LOS E)	—	F*	EB West John Street lefts (LOS F*) and SB Route 106 lefts (LOS E)	—
Route 106 and Duffy Avenue	D	WB Duffy Avenue and SB Route 106 rights (LOS E)	yes	F*	SB Route 106 throughs (LOS F*) and WB Duffy Avenue and EB Duffy Avenue lefts (LOS F)	yes
Route 107 and East John Street	C	NB Route 107 lefts (LOS E)	—	C	—	—
Woodbury Road and Bay Avenue/East Barclay Street	B	—	—	B	—	—
Huntington						
Route 110 and Broadway/Railroad Street	C	EB Railroad Street throughs/rights (LOS E) and lefts (LOS F)	—	F*	EB Railroad Street throughs/rights and SB Route 110 lefts (LOS F*)	—
Park Avenue and Broadway	F*	NB Park Avenue lefts (LOS F*)	yes	F*	EB Broadway lefts (LOS F*)	yes
Ronkonkoma						
Hawkins Avenue and LIE North Service Road	D	NB Hawkins Avenue lefts and SB LIE North Service Road (LOS E)	yes	C	—	—
Hawkins Avenue and LIE South Service Road	D	SB Hawkins Avenue lefts (LOS F)	—	F*	NB Hawkins Avenue (LOS F*)	yes
Hawkins Avenue and Union Avenue	B	—	—	C	SB Hawkins Avenue lefts (LOS F)	yes
Ronkonkoma Avenue Ramp and Railroad Avenue	A	—	—	A	—	—
Babylon						
Deer Park and Park Avenues	F*	SB Deer Park Avenue (LOS F*)	yes	D	SB Deer Park Avenue (LOS E)	yes
Deer Park and Railroad Avenues	B	EB Railroad Avenue lefts (LOS F)	yes	E	EB Railroad Avenue lefts (LOS F)	yes
Deer Park Avenue and West Main Street	C	—	—	F*	NB Fire Island Avenue (LOS F*) and SB Deer Park Avenue (LOS F)	yes
Great Neck						
Middle Neck Road and North Station Plaza	F*	NB Middle Neck Road lefts (LOS F*)	yes	F*	WB North Station Plaza lefts (LOS F*)	yes
Middle Neck Road and South Station Plaza	F*	NB Middle Neck Road lefts (LOS F*) and EB South Station Plaza lefts (LOS E)	yes	C	NB Middle Neck Road lefts, EB South Station Plaza and WB South Station Plaza lefts (LOS E)	yes

Table 9E-8 (Continued)

No Action Parking Capacity and Utilization at LIRR Stations

Station	Off-Street Capacity	Off-Street Parking Usage	Utilization (percent)	Parked On-Street
Port Jefferson Branch (continued)				
Westbury	583	752	129.0	210
Hicksville	3,328	4,450	133.7	160
Syosset	1,221	1,650	135.1	158
Cold Spring Harbor	969	1,263	130.3	0
Huntington	3,820	4,858	127.2	355
Greenlawn	452	319	70.6	0
Northport	1,096	832	75.9	0
Kings Park	771	754	97.7	16
Smithtown	794	452	56.9	0
St. James	312	218	69.8	0
Stony Brook	444	415	94.2	0
Port Jefferson	678	337	49.7	0
Branch Total	*15,850*	*18,099*	*114.2*	*1,446*
Oyster Bay Branch				
East Williston	201	289	143.9	75
Albertson	77	32	41.1	92
Roslyn	336	340	101.3	92
Greenvale	190	104	54.7	20
Glen Head	168	175	104.0	15
Sea Cliff	133	145	108.7	0
Glen Street	132	127	95.8	0
Glen Cove	161	184	114.1	0
Locust Valley	187	279	149.0	0
Mill Neck	N/A	N/A	N/A	N/A
Oyster Bay	338	53	15.6	0
Branch Total	*1,923*	*1,726*	*89.7*	*294*
West Hempstead Branch				
St. Albans	N/A	N/A	N/A	N/A
Westwood	62	56	89.6	0
Malverne	188	218	116.1	0
Lakeview	55	66	119.3	23
Hempstead Gardens	0	0	N/A	66
W. Hempstead	980	485	49.4	0
Branch Total	*1,285*	*824*	*64.1*	*88*
Long Beach Branch				
Lynbrook	1,040	793	76.3	107
Centre Avenue	133	103	77.5	7
East Rockaway	169	196	115.8	0
Oceanside	580	659	113.6	79
Island Park	466	537	115.2	0
Long Beach	223	234	105.1	307
Branch Total	*2,611*	*2,522*	*96.6*	*499*

Table 9E-11 (Continued)
Preferred Alternative Traffic Level of Service and Significant Impact Summaries: Long Island Rail Road Station Areas

Intersection	AM Peak Hour			PM Peak Hour		
	LOS	Critical Movements with LOS E or F	Signif. Impact	LOS	Critical Movements with LOS E or F	Signif. Impact
Malverne						
Hempstead Avenue and Utterby Road	C	—	—	B	—	—
Hempstead Avenue/Francis Street/LIRR Entrance	C	—	—	C	—	—

At *Merrick*, one of the three intersections analyzed—Merrick Avenue and Smith Street—would have a significant impact and require a minor signal retiming during the PM peak hour.

At *Babylon*, all three intersections analyzed along Deer Park Avenue would require traffic improvements to mitigate expected traffic impacts. At Deer Park and Railroad Avenues, a significant egress point from the LIRR station, it would be necessary to signalize this currently unsignalized intersection. At Deer Park and Park Avenues, a key intersection through which station and nonstation traffic passes, it would be necessary to remove four on-street parking spaces to formally add a second southbound traffic lane at the intersection. There are currently two traffic lanes available at the approach to the intersection, but the curb lane is available for a short distance; according to capacity analysis procedures, a greater length is needed for this short lane to operate effectively. Signal retiming would also be needed at this location. At Deer Park Avenue and Main Street, signal retiming would be needed during the PM peak period.

One of the two intersections analyzed at *Deer Park* would experience significant impacts. The traffic signal at Pine Aire and Executive Drives on the south side of the LIRR tracks would need to be retimed in the AM peak. This would provide additional green signal time to the heavy right-turn movement along westbound Pine Aire Drive en route to the LIRR station and Heartland Industrial Park.

One of the two intersections analyzed at *Huntington* would have significant impacts. The signal timings at the intersection of Broadway and Park Avenue would need to be retimed to be more responsive to directional traffic demands. This would entail providing more exclusive green signal time to left turns from northbound Park Avenue in the AM peak, and slightly more green time to eastbound Broadway in the PM peak.

At *Ronkonkoma*, three of the four intersections analyzed would require signal retimings to mitigate otherwise significant traffic impacts. These intersections are Hawkins and Union Avenues, one block north of the station (PM peak hour impact), and the intersections of the LIE service roads and Hawkins Avenue (one AM impact, one PM impact).

The analyses conducted at the other five LIRR stations—Mineola, Hempstead, Malverne, Long Beach, and Port Jefferson—indicated that significant traffic impacts are not expected and traffic mitigation measures would therefore not be needed.

Since the detailed traffic impact analyses were conducted for a representative set of 15 LIRR stations, it can reasonably be expected that standard traffic engineering improvements would likely be sufficient to mitigate traffic impacts that might occur at any of the LIRR's numerous other stations. This is based on a detailed analysis of a set of intersections that include some of increased delays within conditions that are already LOS E or F. Intersection-by-intersection LOS findings are shown in Table 9E-11. Additional details on average vehicle delays and volume-to-capacity (v/c) ratios are provided in the Technical Appendix, which gives a more detailed comparison of the No Action and Preferred Alternatives for each traffic movement at each of the 39 intersections analyzed.

It is even more important to note that each of the significant traffic impacts identified in this analysis can be mitigated using standard traffic engineering improvements, such as signal phasing and/or timing changes, restriping traffic lanes to provide slightly additional or reconfigured lane widths, and/or more restrictive parking regulations. These are the types of traffic capacity improvements typically implemented at the state or county level as part of a transportation agencies' standard responsibilities. None of the significant traffic impacts identified would require costly engineering improvements, such as roadway widenings. A description of the types of mitigation measures that might be needed to accommodate the traffic demands associated with the Preferred Alternative follows for locations that would have significant impacts.

At the *Great Neck* station area, both intersections analyzed along Middle Neck Road—at Station Plaza North and at Station Plaza South—would have significant impacts. These are the two intersections located right at the edge of the LIRR station area that would be the focus of new traffic en route to or from the station. However, with traffic lane restripings, signal timing modifications, and installation of new actuated lead or left-turn phases, these impacts would be mitigated.

At *Hicksville*, one of the four intersections analyzed would experience a significant traffic impact as a result of the project—Newbridge Road (Route 106) at Duffy Avenue, located at the northeast corner of the municipal parking garage which is used by LIRR commuters. This impact could be mitigated with minor signal retiming. None of the other intersections analyzed would be significantly impacted.

At *Bayside*, both intersections analyzed would experience significant impacts and require traffic mitigation. At the intersection of Northern Boulevard and Bell Boulevard, which has the heaviest traffic volumes in the area, it would be necessary to prohibit parking on the northbound Bell Boulevard approach in the AM peak period; re-stripe the eastbound Northern Boulevard approach from its current designation with a shared left-turn/through lane, two through lanes, and a right-turn lane, to a left-turn-only lane, two through lanes, and a right-turn lane; and re-time the traffic signal. At the Bell Boulevard/41st Avenue intersection, located right across from the LIRR station stairwells and the focal point for considerable LIRR rider pick-up and drop-off activity, a 2-foot offsetting of the Bell Boulevard centerline to permit inclusion of a northbound left-turn lane on Bell Boulevard, plus a retiming of the traffic signal, would be sufficient to mitigate traffic impacts from the Preferred Alternative.

At *Port Washington*, signal retiming would mitigate significant impacts at the intersection of Main Street and Port Washington Boulevard. This is the most heavily trafficked intersection in the area, traversed by traffic heading toward the LIE, the LIRR station area, and commercial Main Street. The other intersection analyzed—at the entrance to the LIRR station from Main Street—would not be significantly impacted.

At *Valley Stream*, one of the three intersections analyzed would experience significant impacts—Merrick Road and South Franklin Avenue. It would require a minor signal retiming during the PM peak hour.

In the AM and PM peak hours, the average maximum queues of vehicles waiting to cross the LIRR tracks while the crossing gates have been activated are projected to increase, generally, by one vehicle or fewer at all analysis locations, with one exception: at Deer Park station. Here, PM peak hour queues are projected to increase by two vehicles along westbound Pine Aire Drive and by three vehicles along southbound Executive Drive. In terms of increased stopped delays to vehicles crossing the LIRR tracks at the eight analysis locations, there are only a few locations where such delays are projected to be close to the 10-second significant impact threshold or more than 10 seconds. These are discussed further below.

Traffic delay increases are projected to be approximately 10-11 seconds per direction to the average vehicle crossing the LIRR tracks along New Hyde Park Road near the New Hyde Park station in the AM peak hour, and 8 to 10 seconds in the PM peak hour. Thus, under the Preferred Alternative, the average vehicle delay to all vehicles crossing the tracks would range from about 21 to 25 seconds in both the AM and PM peak hours. If resulting delays at this grade crossing were to be viewed as the equivalents of delays at traffic signals, the resulting 21- to 25-second delays would be equivalent to LOS C conditions. Although the incremental delay caused by the Preferred Alternative would be greater than 10 seconds in the AM peak hour, this LOS C condition would be considered an acceptable LOS and would not constitute a significant traffic impact.

At the Willis Avenue at-grade crossing of the LIRR tracks just east of Mineola station, traffic delays would increase by a projected 26 to 28 seconds per vehicle in the AM peak hour and by 15 to 16 seconds in the PM peak hour. The resulting equivalent LOS would be mid-LOS D in both time periods and would not constitute a significant traffic impact on motorists crossing at this location, since LOS D is considered marginally acceptable. Prevailing traffic volumes along Willis Avenue in this area are generally modest-to moderate, with about 150 to 200 vehicles per hour per direction crossing the tracks in the AM peak and 250 to 300 vehicles per hour in the PM peak. This is a complex crossing location, since the LIRR tracks diverge with one set of tracks following the Main Line alignment eastward and the other following the Oyster Bay branch alignment northeastward. Currently, at times when the LIRR crossing gates are activated by approaching trains, some vehicle traffic chooses to divert to alternate routes rather than accept the delays by waiting for the crossing gates to stop blocking traffic. This observed reaction on the part of drivers would likely continue as the number of trains crossing Willis Avenue increases significantly (by 13 in the AM and PM peak hours) and as the resulting delays also increase.

At the LIRR at-grade crossing of Jackson Avenue near the Syosset station, traffic delays would increase by a projected 12 seconds in the AM peak and 7 to 8 seconds in the PM peak. In both analysis periods, the resulting average vehicle delays would be about 18 to 20 seconds, indicating LOS C, or acceptable, conditions.

At Deer Park station, there would be one significant traffic impact at the at-grade crossing location at the east end of the track, along Executive Drive. This would occur in the PM peak, when there is a substantial level of traffic departing the area from the Heartland Industrial Park. Southbound Executive Drive traffic would experience increased delays of about 18 seconds. This condition could be partially, if not fully, mitigated by altering the amount of time that the LIRR crossing gate is activated, or in the "down" position. Currently, it appears that the gate is activated once an eastbound train approaches the Deer Park station, even if that train is slowing down to stop at the station. If the point of activation of the crossing gate is changed to the time

Table 9E-11 (Continued)
Preferred Alternative Traffic Level of Service and Significant Impact Summaries: Long Island Rail Road Station Areas

	AM Peak Hour			PM Peak Hour		
Intersection	**LOS**	**Critical Movements with LOS E or F**	**Signif. Impact**	**LOS**	**Critical Movements with LOS E or F**	**Signif. Impact**
Port Washington						
Main Street and Port Washington Boulevard	F*	NB Port Washington Boulevard lefts and EB Main Street lefts/throughs (LOS F*)	yes	D	EB Main Street lefts/throughs and WB Main Street (LOS F)	yes
Main Street and LIRR Station Entrance	A	—	—	A	—	—
Deer Park						
Executive Drive and Long Island Avenue	B	—	—	D	SB Executive Drive throughs and WB Long Island Avenue lefts (LOS E)	—
Executive Drive and Pine Aire Drive	F*	WB Pine Aire Drive rights (LOS F*)	yes	D	SB Executive Drive and WB Pine Aire Drive lefts/throughs (LOS E)	—
Merrick						
Merrick Avenue and Sunrise Highway	F*	WB Sunrise Highway throughs (LOS F*)	—	D	SB Merrick Avenue lefts (LOS F)	—
Merrick Avenue and Broadcast Plaza	A	—	—	A	—	—
Merrick Avenue and Smith Street	D	SB Merrick Avenue throughs/rights (LOS E)	—	F*	NB Merrick Avenue throughs/rights (LOS F*)	yes
Hempstead						
Main Street and West Columbia Street	B	—	—	B	—	—
Main Street and Fulton Street (Route 24)	B	—	—	B	SB Main Street (LOS E)	—
Fulton St. (Route 24) and Washington Avenue	F*	EB Fulton Street. lefts (LOS E) and WB Fulton Street left/throughs (F*)	—	F*	WB Fulton Street lefts/throughs (LOS F*)	—
Long Beach						
West Park Avenue and Parking Lot Entrance	B	—	—	B	—	—
West Park Avenue and Center Street	B	—	—	B	—	—
West Park Avenue and Edwards Boulevard	B	—	—	B	—	—
Bayside						
Bell Boulevard and Northern Boulevard	F*	NB Bell Boulevard (LOS F*)	yes	C	NB Bell Boulevard (LOS E)	—
Bell Boulevard and 41st Avenue	F*	NB Bell Boulevard (LOS F*)	yes	F*	NB Bell Boulevard (LOS F*)	yes
Valley Stream						
South Franklin Avenue and Sunrise Highway	B	SB South Franklin Avenue lefts (LOS E)	—	B	SB South Franklin Avenue lefts (LOS F)	yes
South Franklin Avenue and West Hawthorne Avenue	B	—	—	B	—	—
South Franklin Avenue and Merrick Road	B	—	—	C	—	—
Port Jefferson						
Main Street (Route 25A) and LIRR Entrance	A	—	—	B	NB Main St. lefts (LOS F)	—
Main Street (Route 25A) and North Country Road	F*	NB Main Street and WB North Country Road lefts (LOS F*)	—	F*	SB Main Street lefts, NB Main Street (LOS F) and WB North Country Road lefts (LOS F*) and EB North Country Road (LOS E)	—

Table 9E-13
Preferred Alternative Parking Capacity and Utilization at LIRR Stations

Station	Off-Street Capacity	Off-Street Parking Usage	Utilization (percent)	Parked On-Street
Babylon Branch				
Rockville Centre	1,419	1,744	122.9%	126
Baldwin	1,302	1,541	118.4	361
Freeport	1,152	967	84.0	122
Merrick	1,563	2,053	131.1	202
Bellmore	1,823	2,037	111.7	18
Wantagh	1,508	1,951	129.4	63
Seaford	1,148	1,467	127.7	0
Massapequa	1,798	2,258	125.6	193
Massapequa Park	723	884	122.3	73
Amityville	625	632	101.1	0
Copiague	742	967	130.3	117
Lindenhurst	908	851	93.7	202
Babylon	2,043	2,145	105.0	47
Branch Total	*16,754*	*19,496*	*116.4*	*1523*
Ronkonkoma Branch				
Bethpage	889	1,360	153.0	148
Farmingdale	845	791	93.6	74
Pinelawn	N/A	N/A	N/A	NA
Wyandanch	1,011	1,533	151.6	38
Deer Park	1,361	2,149	157.9	375
Brentwood	871	879	100.9	49
Central Islip	922	1,687	183.0	0
Ronkonkoma	4,998	7,958	159.2	246
Holtsville	N/A	N/A	N/A	N/A
Medford	20	10	51.6	0
Yaphank	42	3	7.0	0
Riverhead	22	25	114.0	0
Mattituck	71	47	66.5	0
Southold	20	1	7.4	0
Greenport	99	72	73.0	0
Branch Total	*11,171*	*16,515*	*147.8*	*930*
Hempstead Branch				
Hollis	N/A	N/A	N/A	N/A
Queens Village	87	77	88.2%	0
Bellerose	42	46	109.0%	0
Floral Park	636	658	103.5%	36
Stewart Manor	157	176	111.9%	0
Nassau Boulevard	249	304	122.3%	0
Garden City	373	457	122.4%	24
Country Life Press	417	167	40.1%	0
Hempstead	896	936	104.4%	0
Branch Total	*2,857*	*2,820*	*98.7%*	*60*

the most heavily trafficked locations near LIRR stations, along key local arterials, and within existing commercial areas.

Traffic conditions at the eight at-grade crossing analysis locations were simulated under the Preferred Alternative. This simulation assumed that the number of trains crossing at each location would increase according to the LIRR's anticipated operations plan, and that traffic volume increases at these crossing locations would reflect project-generated trips to and from adjacent LIRR stations. The findings are shown in Table 9E-12 and discussed below.

Table 9E-12

LIRR Grade Crossing Impacts: Preferred Alternative vs. No Action Alternative

Location	Additional Train Crossings	Additional Queue Length (in vehicles)		Additional Stopped Time at the Gate	
		NB	SB	NB	SB
AM Peak Hour					
New Hyde Park Road (New Hyde Park)**	13	0	+1	11 sec.	10 sec.
Willis Avenue (Mineola)**	13	+1	+1	26 sec.	28 sec.
Franklin Avenue (Garden City)	0	0	0	—*	—
Robbins Lane (Syosset)	8	0	0	—	—
Jackson Avenue (Syosset)	8	0	0	12 sec.	12 sec.
Main Street (Port Jefferson)	1	0	0	2 sec.	—
Hempstead Avenue (Malverne)	0	0	0	—	—
Executive Drive (Deer Park)	4	EB 0 WB 0	SB +1	EB — WB 2 sec.	SB 2 sec.
PM Peak Hour					
New Hyde Park Road (New Hyde Park)**	13	0	0	8 sec.	10 sec.
Willis Avenue (Mineola)**	13	0	+1	16 sec.	15 sec.
Franklin Avenue (Garden City)	0	+1	0	—	—
Robbins Lane (Syosset)	8	0	0	—	2 sec.
Jackson Avenue (Syosset)	8	0	0	7 sec.	8 sec.
Main Street (Port Jefferson)	1	+1	0	—	—
Hempstead Avenue (Malverne)	0	0	0	—	—
Executive Drive (Deer Park)	4	EB 0 WB +2	SB +3	EB — WB —	SB 18 sec.

Notes:
* — = Negligible, i.e., under 2 seconds.
** These grade crossings may be eliminated in conjunction with the Main Line Third Track Project.

In general, the primary impacts of the Preferred Alternative on traffic delays at at-grade crossing locations would result from the increased number of LIRR trains being operated rather than from increased traffic generated at these crossing locations. At a number of locations, impacts would be attributable to a combination of these two factors. The largest impact at grade crossings would be experienced along the Main Line, since the operating plans assumed under the Preferred Alternative indicate that 13 additional trains would be operated along this line through New Hyde Park and Mineola, with 8 of the 13 additional trains operated through Syosset. The findings of the simulated Preferred Alternative analyses are shown in Table 9E-12 and discussed below.

Table 9E-13 (Continued)
Preferred Alternative Parking Capacity and Utilization at LIRR Stations

Station	Off-Street Capacity	Off-Street Parking Usage	Utilization (percent)	Parked On-Street
Port Jefferson Branch				
New Hyde Park	651	815	125.2	106
Merillon Avenue	153	232	151.8	0
Mineola	564	762	135.1	435
Carle Place	14	61	437.1	28
Westbury	583	783	134.3	218
Hicksville	3,328	4,633	139.2	167
Syosset	1,221	1,718	140.7	164
Cold Spring Harbor	969	1,314	135.6	0
Huntington	3,820	5,057	132.4	370
Greenlawn	452	332	73.5	0
Northport	1,096	866	79.1	0
Kings Park	771	784	101.7	17
Smithtown	794	470	59.2	0
St. James	312	227	72.7	0
Stony Brook	444	435	98.0	0
Port Jefferson	678	350	51.7	0
Branch Total	*15,850*	*18,839*	*118.9*	*1,505*
Oyster Bay Branch				
East Williston	201	291	144.6	76
Albertson	77	32	41.3	92
Roslyn	336	342	101.8	92
Greenvale	190	104	55.0	20
Glen Head	168	176	104.5	15
Sea Cliff	133	145	109.2	0
Glen Street	132	127	96.3	0
Glen Cove	161	185	114.7	0
Locust Valley	187	280	149.7	0
Mill Neck	N/A	N/A	N/A	N/A
Oyster Bay	338	53	15.7	0
Branch Total	*1,923*	*1,735*	*90.2*	*295*
West Hempstead Branch				
St. Albans	N/A	N/A	N/A	N/A
Westwood	62	67	107.8	0
Malverne	188	263	139.8	0
Lakeview	55	79	143.7	27
Hempstead Gardens	0	0	N/A	79
West Hempstead	980	583	59.5	0
Branch Total	*1,285*	*992*	*77.2*	*106*
Long Beach Branch				
Lynbrook	1,040	823	79.1	111
Centre Avenue	133	107	80.4	7
East Rockaway	169	203	120.1	0
Oceanside	580	683	117.8	81
Island Park	466	557	119.4	0
Long Beach	223	243	109.0	318
Branch Total	*2,611*	*2,615*	*100.2*	*518*

at which the train comes to a full stop in the station, a considerable amount of unnecessary traffic delay time at the crossing gate can be saved.

Parking

The LIRR ridership growth projections were utilized to determine impacts on parking at each station under the Preferred Alternative. Station-by-station parking projections are presented within Table 9E-13. The Preferred Alternative can be expected to increase parking demands at each of the LIRR's 124 stations in suburban Queens and Long Island. Several stations would be able to accommodate the projected parking demands because there would be sufficient parking space in their parking facilities in the future. At other stations where there would be sufficient parking in place without the proposed project, the parking demands generated by it would cause shortfalls that would not be expected under the No Action Alternative. At still other stations, future parking demands even without the Preferred Alternative are projected to exceed future parking capacities—in some cases at stations where capacity increases are already planned and where the project could exacerbate anticipated parking shortfalls. Defining the parking impacts or "contribution" of the project to anticipated parking shortfalls must be viewed on a station-by-station basis. However, there are a series of parking mitigation options available, with the selection of the most viable options varying by station.

The parking impact analysis that follows begins with an assessment of potential impacts at the 15 representative stations profiled and analyzed within this DEIS, and then proceeds to an extrapolation of findings just as was done for the traffic impact analyses.

At *Bayside*, the Preferred Alternative is expected to increase parking demand by about 225 spaces. The off-street parking supply at the station is currently limited to a single 75-space parking lot, of which only about half of the spaces are long-term commuter-type parking. LIRR surveys have indicated that about 1,000 riders currently park on nearby residential streets or on other streets at some distance from the station. Under the No Action Alternative, the parking demand is expected to increase fairly modestly, so the projected increase of 225 spaces from the Preferred Alternative would place considerable burdens on the adjacent residential areas and would be considered a significant impact requiring mitigation. It is also possible that at Bayside, which is characterized by a very significant percentage of bus use and pick-ups/drop-offs without parking, the transit/pick-up/drop-off share would increase to accommodate projected new parking demands.

At *Great Neck*, the Preferred Alternative is expected to increase parking demand by about 76 spaces. The existing supply of off-street parking spaces in the station area is currently limited and nearly fully utilized, and can be expected to be fully utilized under the No Action Alternative. Mitigation options at this station include adding new off-street parking facilities or further encouraging the already significant use of bus access and pick-up/drop-off activity at the station.

At *Port Washington*, the Preferred Alternative is expected to increase parking demand by about 167 spaces. Under the No Action Alternative, it is projected that the parking supply at this station will be 100 percent utilized (current parking utilization is very close to that as well). Because of very restrictive parking regulations on the residential streets within walking distance of the station, there are few, if any, on-street parkers today; such activity would not be likely to occur in the future. Previous studies have been undertaken (however, not by LIRR) to implement shuttle bus service to the station, but so far none have prevailed. Therefore, mitigation

Preferred Alternative is projected to increase parking demand by an additional 20 spaces. Although there would not be a sufficient number of spaces in the station's parking lots to accommodate the 20-car demand increase, this incremental demand is small enough so as not to be considered a significant impact. If plans materialize to increase parking supplies at the station, it would be easy to accommodate this 20-car incremental demand as well. If not, there is a considerable level of bus access activity at the station and on-street parking supplies south of Park Avenue that could accommodate this level of parking need.

At *Hempstead*, the Preferred Alternative is expected to increase parking demand by about 149 vehicles. This would increase projected parking demand levels at the station's parking lots from about 88 percent under the No Action Alternative to 104 percent under the Preferred Alternative, with a projected parking shortfall of about 40 spaces. Since this shortfall falls within 5 percent of the existing parking lot capacities, and a 5 percent variation of parking demand is not unusual day-to-day, there could in fact be no shortfall in the future. This condition could be monitored and, if necessary, minor parking space capacity improvements in the parking lots at the station may accommodate this incremental demand. There is also a considerable amount of feeder bus activity at this station, which could also serve to accommodate a slightly higher level of bus transit use in lieu of parking.

At *Malverne*, the Preferred Alternative is expected to increase parking demand by about 45 vehicles. Although the existing parking lots at the station are currently operating at about 92 percent of their 188-space capacity, the No Action Alternative is projected to have a shortfall of 30 parking spaces. It may be possible to increase the amount of off-street parking spaces to accommodate these demands. It is also possible that many of the commuters using this station who live in West Hempstead just north of the Southern State Parkway would instead begin to use that station which has considerable excess parking lot capacity.

The *Valley Stream* station currently has approximately 1,285 off-street parking spaces that are planned by the LIRR to increase to 1,515 under the No Action Alternative, whereby parking lot utilization would be at about 79 percent. The Preferred Alternative is expected to increase parking demands by about 64 spaces, which should be readily accommodated by the availability of spaces at the station, and there would be no parking impact or need for mitigation.

At *Merrick*, the Preferred Alternative is expected to increase parking demand by about 122 vehicles. Parking lots at this station are currently utilized above their capacity, with about 160 additional vehicles parking on the street. Under the No Action Alternative, parking demand is projected to increase by about 345 vehicles and could not be accommodated "as is." LIRR is currently undertaking a Merrick Area Revitalization Study, which is also investigating the need and opportunities for increasing parking supplies at this station. Recommendations emerging from this study could incorporate the additional parking demand projected from the Preferred Alternative.

At *Babylon*, the Preferred Alternative is expected to increase parking demand by about 119 vehicles. Under the No Action Alternative, it is projected that current parking capacity (about 84 percent utilized) would be 100 percent utilized. Accommodation of the parking demand from the Preferred Alternative would be needed, possibly via parking capacity expansion at grade, possibly along the north side of Railroad Avenue, via creation of another surface lot east of Deer Park Avenue, or at another site to be determined.

At *Deer Park*, the Preferred Alternative is expected to increase parking demand by about 282 vehicles. The one parking lot currently located at the station is well above capacity, with

Table 9E-13 (Continued)
Preferred Alternative Parking Capacity and Utilization at LIRR Stations

Station	Off-Street Capacity	Off-Street Parking Usage	Utilization (percent)	Parked On-Street
Far Rockaway Branch				
Locust Manor	0	0	N/A	26
Laurelton	52	61	118.0	12
Rosedale	211	53	25.2	153
Valley Stream	1,515	1,255	82.8	51
Gibson	71	80	113.1	24
Hewlett	815	1,049	128.8	22
Woodmere	306	335	109.6	472
Cedarhurst	797	739	92.7	35
Lawrence	201	133	66.4	35
Inwood	212	124	58.5	0
Far Rockaway	150	1	0.8	0
Branch Total	*4,330*	*3,832*	*88.5*	*830*
Montauk Branch				
Bay Shore	499	488	97.8	0
Islip	445	307	69.0	0
Great River	121	98	80.9	0
Oakdale	271	161	59.4	0
Sayville	535	594	111.1	0
Patchogue	653	455	69.0	0
Bellport	35	0	0.0	0
Center Moriches	N/A	N/A	N/A	N/A
Mastic-Shirley	195	206	105.5	0
Speonk	305	161	52.8	2
Westhampton	88	13	15.1	0
Quogue	N/A	N/A	N/A	N/A
Hampton Bays	190	50	26.2	0
Southampton	99	73	73.8	0
Southampton Campus	N/A	N/A	N/A	N/A
Bridgehampton	85	83	97.6	0
East Hampton	373	171	45.8	30
Amagansett	35	33	94.8	0
Montauk	60	5	8.3	0
Branch Total	*3,989*	*2,898*	*72.6*	*32*
Port Washington Branch				
Flushing	572	714	124.9	0
Murray Hill	0	0	N/A	393
Broadway	79	112	142.3	831
Auburndale	0	0	N/A	1,048
Bayside	75	60	79.9	1,248
Douglaston	118	149	126.0	625
Little Neck	113	139	122.7	500
Great Neck	360	443	123.3	0
Manhasset	496	613	123.6	0
Plandome	255	211	82.8	0
Port Washington	795	968	121.8	0
Branch Total	*2,863*	*3,409*	*119.1*	*4,644*

- Construction of new station(s) near or between two major stations where parking demands greatly exceed parking availability.
- Provision of bicycle racks and/or lockers to promote increased bicycle use for access to stations.
- Definition of new parking policies that address jurisdictional issues regarding station parking.
- Various combinations of the above.

Ridership and parking projections that have been completed as part of the Preferred Alternative will need to be monitored, and the LIRR would need to be ready to implement one or more of the strategies listed above to mitigate parking impacts of the project at individual stations.

TSM ALTERNATIVE

Under the TSM Alternative, LIRR ridership would be only marginally higher—1.7 percent higher—than under the No Action Alternative. Over the 4-hour AM peak period, ridership increases under the TSM Alternative would be about 15 percent of the increase projected for the Build Alternative. Therefore, it can be assumed that peak hour vehicle traffic generated at each LIRR station would also be about 15 percent of the traffic that was determined to be generated at these stations under the Preferred Alternative.

Table 9E-14 presents the projected vehicle traffic generated at each of the 15 stations analyzed in detail, compared with the traffic generation at each station under the Preferred Alternative.

Table 9E-14

Vehicle Trips Generated at LIRR Stations Under the TSM Alternative (AM Peak Hour)

Station	Vehicle Trips	
	Preferred Alternative	TSM Alternative
Bayside	189	28
Great Neck	176	26
Port Washington	193	29
Mineola	16	2
Hicksville	132	20
Huntington	90	14
Port Jefferson	4	1
Long Beach	8	1
Hempstead	36	5
Malverne	5	1
Valley Stream	27	4
Merrick	37	6
Babylon	72	11
Deer Park	64	10
Ronkonkoma	270	41

options at this station could include implementation of shuttle bus service as well as the more conventional option of increasing parking supply.

The *Mineola* station is projected to have a parking demand increase for 47 parking spaces. Parking supply at this station currently comprises about 564 off-street spaces and considerable use of on-street metered spaces that allow for long-term commuter parking south of the tracks. Under the No Action Alternative, parking demands are expected to increase substantially—by about 289 spaces—and would result in demand levels in excess of available spaces off-street. This would also test the limit of availability for on-street spaces, although there are a number of blocks south of the tracks and west of the immediate parking area where metered parking is still available. These two projections—a parking demand increase of about 289 spaces in the No Action Alternative and 47 spaces under the Preferred Alternative—appear to affect future parking planning in the following way. Any measures to increase off-street parking supplies would need to increase the number of spaces incrementally to accommodate new riders resulting from the Preferred Alternative. The Mineola station is also a station with a significant level of bus service and pick-up/drop-off activity, so transit access should be encouraged. Another option that can be considered here would be improvement of pick-up/drop-off space to further encourage such activity in lieu of parking demands. Current pick-up/drop-off activity occurs on both sides of the tracks without the benefit of design clarity and with significant delays to auto traffic. Improvements to these conditions could further encourage pick-ups and drop-offs and reduce the demand for parking to some degree.

At *Hicksville*, the Preferred Alternative is expected to increase parking demand by about 189 spaces. This station currently possesses one of the largest supplies of off-street parking of any LIRR station (over 3,300 spaces). These are fully used, in addition to an estimated 120 commuter vehicles parking on-street. Under the No Action Alternative, parking demand is projected to increase by about 1,159 spaces and would be a considerable challenge to accommodate. The Preferred Alternative is projected to increase parking demand at the station by 15 percent (189 spaces). Parking solutions at this station to the No Action Alternative would invariably need to consider provision of additional parking, possibly decking one of the existing parking lots with a second parking structure (there already is one major parking garage one block south of the station). The incremental needs generated by the Preferred Alternative should be incorporated within any solution considered for the No Action Alternative.

At *Huntington*, the Preferred Alternative is expected to increase parking demand by about 214 spaces. This station currently has about 3,820 off-street parking spaces within two parking garages and a number of parking fields, and is operating at about 95 percent of capacity. Under the No Action Alternative, projected parking demand increases in excess of 1,300 spaces would leave a substantial parking shortfall; the Preferred Alternative's parking demands would represent a surcharge of about 15 percent and would need to be accommodated in conjunction with any plan the LIRR develops to meet its future parking shortfall at this station.

At *Port Jefferson*, the Preferred Alternative is projected to increase parking demands by 14 spaces. There would be ample space available to accommodate this incremental demand, since current parking lot utilization is slightly less than 50 percent, and since the LIRR has plans to increase parking supplies at the station by about 150 spaces as part of its current program.

The *Long Beach* station's parking lots are currently utilized at about 90 percent of their capacity of 223 spaces, with more than 260 commuter vehicles parking on-street. Under the No Action Alternative, the parking demand is projected to increase by about 79 vehicles, while the as the following: installation of traffic signals at significantly impacted intersections that are not currently signalized; signal phasing and timing modifications at intersections that are currently signalized; lane restriping and/or parking restrictions where necessary to add capacity at the approaches to critical intersections; and, the offset of the centerline of a street where it would be necessary to add capacity to one direction of traffic flow. These are generally low-cost, readily implementable traffic capacity improvements typically implemented at the state or county level as part of transportation agencies' standard operational responsibilities. This is based on detailed analyses of projected traffic conditions at 15 representative LIRR stations.

Based on a detailed analysis of eight representative LIRR at-grade crossing locations, there could also be significant impacts at a smaller number of such locations. At such locations, for example, at the east end of the Deer Park station, it may be possible for LIRR to modify the amount of time that the crossing gate is in the "down" position while a train is stopped within the station to serve riders getting on or off.

More importantly, the Preferred Alternative would result in substantial increases in ridership demand at many LIRR stations. Resulting parking shortfalls at LIRR stations—which would occur under the No Action Alternative as well, but which would be exacerbated with the Preferred Alternative—should be monitored station by station by the LIRR. As detailed in the preceding section, a range of strategies is available to mitigate such shortfalls and accommodate the growth in ridership. These include physical expansion of the amount of parking available at some stations; modification of train schedules to improve or increase service at stations where parking would still be available or where additional parking would be easier to build; the increase and promotion of bus service, carpooling, and kiss-and-ride at selected stations; construction of new stations with new parking facilities; and other measures (refer to the end of the previous section for additional discussion of these options). The appropriate parking strategy for each station should be formulated during the lengthy planning period available prior to the completion and start-up of the Preferred Alternative.

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commuters parking illegally in the aisles, on dividers and landscaped areas, and on the street. LIRR has planned to expand this parking lot by 300 spaces, and it is included as part of the future No Action Alternative. Yet even with this capacity increase, future No Action parking demands will continue to greatly exceed the increased supply, with future No Action shortfalls in excess of 350 spaces. The impact of the Preferred Alternative, assuming the projected demand at this station materializes, would be significant, since it would compound No Action parking shortfalls to a significant degree. The primary solution at this station would appear to be a significant parking increase, i.e., beyond the 300 spaces planned, either by creating structured parking on the north side of the tracks or by creating new parking on the south side of the tracks.

Ronkonkoma station is one of the busiest and most heavily used stations in the LIRR system, with its nearly 5,000 parking space capacity fully utilized along with considerable illegal parking (as described for Deer Park above). Under the No Action Alternative, approximately 1,700 more vehicles would be anticipated at this terminal station, while the Preferred Alternative is expected to increase parking needs still further, by about an additional 927 spaces. This is a major shortfall under both the No Action and Preferred Alternatives that would call for additional parking garage(s) beyond the major facility built several years ago, or else a strategy of diverting rider demand to another station (or stations) at which the increased ridership and its parking demand could be satisfied.

The parking analyses and Table 9E-13 identify the need for strategies to accommodate increased parking demands generated by the Preferred Alternative. As discussed immediately above, additional parking facilities would be needed at LIRR stations, but not all. Some stations would retain the capacity to accommodate additional parking demands.

The range of parking mitigation or accommodation options could include consideration of one or more of the following on a station-by-station basis:

- Re-striping of existing surface parking lots to increase capacity, expansion of existing lots, or construction of new lots.
- Construction of parking garages atop existing surface lots or at new locations.
- Modification of train service and schedules to improve or increase service at stations with available parking or where parking could be added more easily.
- Institution of fare policy changes to attract riders to a new station by shifting one or more stations from one fare zone to another.
- Increase of existing bus service to stations to promote bus use. Free or heavily subsidized fares and combination fare tickets could also be considered.
- Implementation of new station-oriented feeder bus service or jitney service, with local riders or a local Chamber of Commerce or Business Improvement District group designing the route themselves.
- Substantial improvements to and prioritization of kiss-and-ride facilities to increase pick-up/drop-off activity and reduce parking demand.
- Provision of preferential parking areas for carpoolers, with enforcement. Consideration could also be given to decreasing parking charges for carpoolers, although this is outside of LIRR jurisdiction.

area was performed. In addition, both the Preferred and Transportation Systems Management (TSM) Alternatives would reduce vehicular travel in the region, as measured in annual vehicle miles traveled. Therefore, a regional analysis was performed for CO, computing expected reductions of CO emitted in a year, to determine potential benefits resulting from the general changes in vehicular activity on overall background levels of this pollutant.

NITROGEN OXIDES AND OZONE

Nitrogen oxides (NO_x) are of principal concern because of their role, together with volatile organic compounds (VOCs), as precursors in the formation of ozone. While there is a standard for average annual nitrogen dioxide (NO_2) concentrations, it is normally examined only for fossil fuel energy sources. Ozone is formed through a series of reactions that take place in the atmosphere in the presence of sunlight. Because the reactions are slow and occur as the pollutants are diffusing downwind, elevated ozone levels are often found many miles from sources of the precursor pollutants. The effects of NO_x and VOC emissions from mobile sources are therefore generally examined on a regional basis, together with the emissions of these pollutants from stationary sources. The change in regional mobile source emissions of these pollutants is related to the total number of vehicle trips and vehicle miles of travel throughout the New York Metropolitan Area (NYMA), which is designated as a severe non-attainment area for ozone by EPA. The Preferred and TSM Alternatives would potentially result in changes to the regional vehicular travel patterns in the study area zones. Therefore, the change in regional NO_x and VOC emissions was analyzed.

LEAD

Lead emissions are principally associated with industrial sources and motor vehicles that use gasoline containing lead additives. Most U.S. vehicles produced since 1975, and all produced after 1980, are designed to use unleaded fuel. As these newer vehicles have replaced the older ones, motor-vehicle-related lead emissions have decreased. As a result, ambient concentrations of lead have declined significantly. Nationally, the average measured atmospheric lead level in 1985 was only about one-quarter the level in 1975.

In 1985, EPA announced new rules drastically reducing the amount of lead permitted in leaded gasoline. The maximum allowable lead level in leaded gasoline was reduced from the previous limit of 1.1 to 0.5 grams per gallon effective July 1, 1985, and to 0.1 grams per gallon effective January 1, 1986. Monitoring results indicate that this action has been effective in significantly reducing atmospheric lead levels. Even at locations in the New York City area where traffic volumes are very high, atmospheric lead concentrations are far below the national standard of 1.5 micrograms per cubic meter (3-month average). No significant sources of lead are associated with the proposed project, and, therefore, an analysis was not warranted.

RESPIRABLE PARTICULATES—PM_{10}

Particulate matter is emitted into the atmosphere from a variety of sources: industrial facilities, power plants, oil burners, construction work, and similar activities. Gasoline-powered vehicles do not produce any appreciable quantities of particulate emissions. Diesel-powered vehicles, especially heavy trucks and buses, as well as diesel-powered locomotives, do emit particulates; particulate concentrations may therefore be locally elevated near roadways with high volumes of heavy diesel-powered vehicles or near storage yards for diesel trains.

Since the Preferred Alternative would generate six to seven times the volume of traffic at these stations, compared to the TSM Alternative, and since all significant traffic impacts created by the Preferred Alternative were found to be mitigatable via standard non-capital intensive traffic engineering measures, it can readily be concluded either that the TSM Alternative would not generate significant impacts or that its impacts would also be readily mitigatable.

Regarding station parking demands, the TSM Alternative would also generate far less of a demand for parking than would the Preferred Alternative, since it would generate and be able to service just a modest number of new riders. Station-by-station parking demands under the TSM Alternative were also estimated as 15 percent of the increased demand for the Preferred Alternative, as shown in Table 9E-15.

Table 9E-15
Parking Demand Generated at LIRR Stations under the TSM Alternative vs. the Preferred Alternative

Station	New Parking Needs	
	Preferred Alternative	TSM Alternative
Bayside	225	34
Great Neck	76	11
Port Washington	167	25
Mineola	47	7
Hicksville	189	28
Huntington	214	32
Port Jefferson	14	2
Long Beach	20	3
Hempstead	149	22
Malverne	45	7
Valley Stream	64	10
Merrick	122	18
Babylon	119	18
Deer Park	282	42
Ronkonkoma	927	139

In several of the station "cases" examined above, parking increases are so small that they can be considered either negligible or within the range of day-to-day variation. They would therefore not require significant mitigation—i.e., expansion of the parking lot or creation of new parking facilities. The one notable exception would be at Ronkonkoma, where a combination of existing parking space shortfalls and a projected parking demand increase of 139 spaces would create a need for mitigation.

MITIGATION

The Preferred Alternative would generate significant traffic and parking impacts at LIRR stations in Eastern Queens and Long Island that would require mitigation. As detailed in the preceding section of this DEIS, significant traffic impacts would occur at some, but not all, LIRR stations areas, and could be mitigated via standard traffic engineering improvements such implementation plans respecting $PM_{2.5}$ are required. Table 10-1 shows the standards for these pollutants. These standards have also been adopted as the ambient air quality standards for the State of New York. The primary standards protect the public health, and represent levels at which there are no known significant effects on human health. The secondary standards are intended to protect the nation's welfare, and account for air pollutant effects on soil, water, visibility, materials, vegetation, and other aspects of the environment. For CO, NO_2, ozone, and respirable particulates, the primary and secondary standards are the same.

Table 10-1
National and New York State Ambient Air Quality Standards

Pollutant	Primary		Secondary	
	PPM	**Micrograms Per Cubic Meter**	**PPM**	**Micrograms Per Cubic Meter**
Carbon Monoxide				
Maximum 8-Hour Concentration[1]	9		9	
Maximum 1-Hour Concentration[1]	35		35	
Lead				
Maximum Arithmetic Mean Averaged Over 3 Consecutive Months		1.5		
Nitrogen Dioxide				
Annual Arithmetic Average	0.05	100	0.05	100
Ozone[2]				
1-Hour Maximum	0.12	235	0.12	235
8-Hour Maximum	0.08	157	0.08	157
Respirable Particulates (PM_{10})				
Annual Geometric Mean		50		50
Maximum 24-Hour Concentration[3]		150		150
Respirable Particulates ($PM_{2.5}$)				
Annual Arithmetic Mean		15		15
Maximum 24-Hour Concentration[4]		65		65
Sulfur Dioxide				
Annual Arithmetic Mean	0.03	80		
Maximum 24-Hour Concentration*	0.14	365		
Maximum 3-Hour Concentration*			0.50	1,300

Notes:

[1] Not to be exceeded more than once a year.

[2] The ozone 1-hour standard applies only to areas that were designated nonattainment when the ozone 8-hour standard was adopted in July 1997.

[3] Not to be exceeded by 99th percentile of 24-hour PM_{10} concentrations in a year (averaged over 3 years).

[4] Not to be exceeded by 98th percentile of 24-hour $PM_{2.5}$ concentrations in a year (averaged over 3 years).

Sources: 40 CFR Part 50—National Primary and Secondary Ambient Air Quality Standards 40 CFR 50.12 "National Primary and Secondary Standard for Lead," 43 CFR 46245.

Chapter 10: Air Quality

A. INTRODUCTION AND METHODOLOGY

This chapter analyzes the effects of the project alternatives on air quality. While the Preferred Alternative for the ESA Project would result in an overall decrease in regional pollutant emissions due to a reduction of vehicular miles traveled, it has the potential to create adverse air quality effects in the vicinity of Grand Central Terminal (GCT) and at LIRR stations in Queens or on Long Island. Both potential localized impacts and regional benefits from operation of the project alternatives on air quality are evaluated in this chapter. Construction-related air quality effects are discussed in Chapter 17, "Construction and Construction Impacts."

In terms of stationary sources, the Preferred Alternative's Option 2 (new tracks and platforms beneath GCT's existing lower level) would require a new emission source. In this option, a heating, ventilation, and air conditioning (HVAC) system for the new station and mezzanine would be created in conjunction with the ventilation facility on East 44th Street. The other ventilation facilities required for the Preferred Alternative would not emit air contaminants during normal operations, since they would be exhausting air from the normal station and tunnel operations.

POLLUTANTS FOR ANALYSIS

In the New York metropolitan area, ambient concentrations of carbon monoxide are predominantly influenced by mobile source emissions; emissions of nitrogen oxides come from both mobile and stationary sources; and emissions of respirable particulate matter and sulfur dioxide are associated mainly with stationary sources, though heavy-duty diesel trucks, buses, and locomotives can emit significant amounts of particulate matter.

Ozone, one of the region's most problematic air pollutants, is not emitted directly by any source but is formed in the atmosphere from the reaction of other primary pollutants.

CARBON MONOXIDE

Carbon monoxide (CO), a colorless and odorless gas, is produced in the urban environment primarily by the incomplete combustion of gasoline and other fossil fuels. New York City and Nassau County are designated as moderate non-attainment areas for CO by the U.S. Environmental Protection Agency (EPA). In an urban area like New York City or Long Island, approximately 80 to 90 percent of CO emissions are from motor vehicles. CO concentrations can vary greatly over relatively short distances. Elevated concentrations are usually limited to locations near crowded intersections, along heavily traveled and congested roadways or at parking lots or garages. Consequently, CO concentrations must be predicted on a localized or microscale basis.

The Preferred Alternative would produce increased traffic in the vicinity of GCT and other heavily utilized stations that may result in localized increases in CO levels. Therefore, an analysis of the impact from traffic increases on CO levels at critical intersections in the project study it is not mandatory that these criteria are followed for this EIS, they have been looked to as guidance for establishing whether a given air pollution increase is significant. These New York City criteria set the minimum change in CO concentration that defines a significant environmental impact. Significant increases with respect to CO concentrations are defined by those criteria as: (1) an increase of 0.5 parts per million (ppm) or more in the maximum 8-hour average CO concentration at a location where the predicted No Action Alternative 8-hour concentration is equal to or between 8 and 9 ppm, or 2) an increase of more than half the difference between baseline concentrations and the 8-hour standard, when No Action Alternative concentrations are below 8.0 ppm.

As part of the 1992 CO SIP submission, NYSDEC committed to a similar de minimis criteria for the Manhattan Central Business District (CBD), which defines a significant impact requiring mitigation for an incremental increase greater than 0.5 ppm over the No Action Alternative.

CONFORMITY WITH NEW YORK STATE AIR QUALITY IMPLEMENTATION PLAN

The 1990 CAAA requires all federally funded or approved transportation projects in non-attainment areas to conform to the purpose of the SIP. These federal air quality requirements are promulgated in *Criteria and Procedures for Determining Conformity to State or Federal Implementation Plans of Transportation Plans, Programs and Projects Funded or Approved Under Title 23 USC or the Federal Transit Act* (40 CFR Parts 51 and 93). In order to demonstrate conformity, actions must not exacerbate or delay the achievement of attainment of standards in such areas. Therefore, the ESA Project is required to conform to the purpose and specific requirements of the SIP, cause no new violations, exacerbation of existing violations, or delays in the achievement of the NAAQS or interim emissions reductions milestones. The project's conformance with these requirements was evaluated, as described in this chapter.

In addition, as described in Chapter 1, "Project Purpose and Need," the New York Metropolitan Transportation Council (NYMTC), in cooperation with local transportation agencies, is responsible for the development of a financially constrained Long Range Plan (LRP) and annual Transportation Improvement Program (TIP) for the New York metropolitan region. As part of its long range plan, NYMTC has developed a TIP, which addresses and coordinates specific transportation projects in the region in accordance with regional transportation goals. The ESA Project is included in the TIP.

METHODOLOGY FOR PREDICTING POLLUTANT CONCENTRATIONS FROM MOBILE SOURCES

To compare estimated CO concentrations with the national and state ambient air quality standards for CO (which are based on 1- and 8-hour averages of CO concentrations), estimates of maximum concentrations for these same periods must be prepared. Since experience in the study area has been that violations of the 1-hour CO standard are extremely rare, the CO analysis for this study focuses on determining the maximum predicted 8-hour CO concentrations for the project alternatives.

The prediction of motor-vehicle-generated CO concentrations in an urban environment characterized by complex meteorological phenomena, traffic conditions, and physical configurations is a challenging problem. Air pollutant dispersion models simulate mathematically how traffic, meteorology, and geometry combine to affect pollutant concentrations. The mathematical expressions and formulations that comprise the various models attempt to describe an extremely

Particulates less than 10 μm in diameter (PM_{10}) have become of primary concern because they are respirable. In addition to PM_{10}, EPA has determined that elevated airborne levels of particulate matter less than 2.5 microns ($PM_{2.5}$), show consistent and coherent associations with serious health effects. Air quality monitoring indicates that, in the past, respirable particulate levels in New York State have exceeded the applicable national ambient air quality standards at only one monitored location, along Madison Avenue in midtown Manhattan. Manhattan continues to be a non-attainment area with respect to PM_{10}. At this location, concentrations have exceeded standards in the past due to high traffic volumes in close proximity to the monitor. It is not expected that the proposed alternatives would affect diesel emissions to any significant degree at this or other locations. Therefore, the proposed alternatives would not result in any significant or adverse impacts on respirable particulate levels in the study area due to increased bus trips or other activities and no detailed analysis of particulates is required. However, due to the relocation of the New York & Atlantic Railway (NYAR) facilities from Yard A, as well as Metro-North Railroad's (MNR's) Madison Yard as part of the Preferred Alternative, some changes in diesel locomotive operations are expected. While the new facilities are generally located far from residential uses, an analysis was conducted to determine the effect, if any, on ambient PM_{10} levels from relocated diesel operations.

SULFUR DIOXIDE

Sulfur dioxide (SO_2) emissions are primarily associated with the combustion of sulfur-containing fuels: oil and coal. No significant quantities are emitted from mobile sources. Monitored SO_2 concentrations throughout the study area are below the national standards. No significant sources of SO_2 are associated with the project, and therefore, an analysis was not warranted.

The air quality analysis presented in this chapter includes an assessment of the following:

- Effects of the project on CO concentrations due to increased traffic around GCT and stations in Queens and on Long Island that are expected to experience large increases in passenger demand;
- Potential effects on regional emissions of CO, VOCs, NO_x, and PM_{10} due to potential changes in vehicular travel patterns in the area resulting from the project; and
- Potential effects on PM_{10} concentrations due to relocated diesel locomotive operations.

AIR QUALITY STANDARDS

NATIONAL AND STATE AIR QUALITY STANDARDS

As required by the Clean Air Act, primary and secondary National Ambient Air Quality Standards (NAAQS) have been established for six major air pollutants: carbon monoxide, nitrogen dioxide, ozone, respirable particulate matter, sulfur dioxide, and lead. EPA recently promulgated additional respirable particulate matter standards. In addition to retaining the PM_{10} standards, EPA adopted 24-hour and annual standards for respirable particulate matter with an aerodynamic equivalent diameter less than 2.5 μm ($PM_{2.5}$), which became effective September 16, 1997. As recognized by EPA, the adoption of the $PM_{2.5}$ standard is intended to provide increased protection of public health from fossil fuel combustion. At this time, EPA is only requiring states to implement monitoring programs for $PM_{2.5}$. It will likely be at least 5 years before any attainment/non-attainment designations are made and a few more years before any

- Heavy-duty, gasoline-powered trucks; and
- Heavy-duty, diesel-powered trucks.

Vehicle classifications as given in NYSDOT's Environmental Procedure's Manual (EPM), based on NYSDOT region and road type, were used for the sites in Queens and on Long Island. Taxis were not modeled distinctly from automobiles for the sites on Long Island, since they do not represent a significant portion of the vehicle mix.

Emission estimates were based on implementation of the New York State auto and light-duty gasoline-powered truck inspection and maintenance (I&M) program begun in January 1982 and the taxi I&M program begun in October 1977. The existing I&M program requires annual inspections of automobiles and light trucks to determine if CO and hydrocarbon emissions from the vehicles' exhaust systems are below emission standards. Vehicles failing the emissions test must undergo maintenance and pass a re-test to be registered in New York State. Oxygenated fuel credits—emission estimates for oxygenated fuels were based on a gasoline blend with a 2.7 percent oxygen content—were taken in the microscale modeling analyses for the months of January-April and October-December only. These are the NYSDEC-approved credits.

For vehicular traffic, PM_{10} emission factors were obtained from EPA's particulate model, PART 5. PM_{10} emission estimates for diesel locomotives were based on data from EPA's "Final Emission Standards for Locomotives," Office of Mobile Sources EPA420-F-97-048, December 1997.

BACKGROUND CONCENTRATIONS

Background concentrations are those pollutant concentrations not directly accounted for through the modeling analysis (which directly accounts for vehicular-generated emissions on the streets within 1,000 to 1,600 feet and line-of-sight of the receptor location). Background concentrations must be added to modeling results to obtain total pollutant concentrations at a prediction site.

Future 8-hour average CO background concentrations used in the analysis were 2.9 ppm for Midtown Manhattan, 2.3 ppm for Queens, 2.2 ppm for Suffolk County and 2.6 ppm for Nassau County. These values, obtained from NYCDEP and NYSDEC, are based on CO concentrations measured at NYSDEC monitoring stations and are adjusted to reflect the reduced vehicular emissions expected in the analysis year. This decrease reflects the increasing numbers of federally mandated lower-emission vehicles that are projected to enter the vehicle fleet as older, higher polluting vehicles are retired (i.e., vehicle turnover), and the continuing benefits of the New York I&M program.

MOBILE SOURCE RECEPTOR LOCATIONS

Receptor sites were placed at locations expected to experience increased vehicular emissions due to traffic increases resulting from the Preferred Alternative, with particular consideration for congested intersections in each study area zone.

The above locations were selected based upon a screening of traffic volumes and approach delays and the corresponding levels of service for the Preferred Alternative. The screening analysis determined the intersections that would be subjected to full-scale microscale analysis for the future alternatives. Candidate intersections (intersections analyzed as part of the transportation chapter) were ranked based on the methodology developed by the New York State Department of Transportation (NYSDOT) and NYSDEC to evaluate critical locations. The screening

STATE IMPLEMENTATION PLAN (SIP)

The Clean Air Act requires each state to submit to EPA a SIP for attainment of NAAQS. The 1977 and 1990 amendments require comprehensive plan revisions for areas where one or more of the standards have yet to be attained. In the New York City metropolitan area, the standard for ozone continues to be exceeded. As part of the SIP, New York State is implementing measures to reduce levels of hydrocarbons and nitrogen oxides as part of its effort to attain the NAAQS ozone standard. The attainment status for the counties in New York City and on Long Island is shown in Table 10-2.

Table 10-2

Counties Designated Non-Attainment by EPA in New York City and Long Island

County	Ozone*	PM_{10}**	CO**
Brooklyn	✓		✓
Bronx	✓		✓
Manhattan	✓	✓	✓
Staten Island	✓		✓
Queens	✓		✓
Nassau	✓		✓
Suffolk	✓		

Notes:
* Severe non-attainment.
** Moderate non-attainment.

The currently effective SIP for CO was approved by EPA in 1984. The New York State Department of Environmental Conservation (NYSDEC) submitted a 1992 revision to the carbon monoxide SIP for the non-attainment counties to EPA and is awaiting final approval. The proposed SIP contains control programs and contingency measures necessary to reduce carbon monoxide emissions to meet the standard in New York City and Nassau County by the Clean Air Act Amendment (CAAA) attainment date of December 31, 1995. As part of the SIP submission, an attainment demonstration was included which showed that all counties would be in compliance with the standard by the deadline. In August 1999, NYSDEC submitted a Redesignation Request for CO, which demonstrates that NYMA has attained and will continue to maintain the CO standard, and therefore proposes NYMA be redesignated to attainment. For ozone, the CAAA requires a series of SIP revisions. These revisions include air quality control measures for target years emission reductions of ozone precursor emissions (volatile organic compounds and nitrogen oxides) and for an ozone attainment demonstration by 2007. In June 1997, NYSDEC submitted an ozone SIP revision that addressed the status of these requirements. In addition, the state submitted a SIP and attainment demonstration for PM_{10} in New York County in 1994.

DE MINIMIS CRITERIA

For all pollutants, causing the NAAQS to be exceeded generally constitutes a significant impact. In addition to the NAAQS, New York City has developed de minimis criteria to assess the significance of impacts on air quality that would result from proposed projects or actions. While

Table 10-4
Mobile Source Receptor Screening Locations, Long Island and Queens

Station	Receptor Site	Location
Nassau County		
Great Neck	6	Middle Neck Road/North Station Plaza
	—	Middle Neck Road/South Station Plaza
Hempstead	—	Main Street/West Columbia Street
	—	Main Street/Fulton Street (Route 24)
	—	Fulton Street/Washington Avenue
Hicksville	—	Newbridge Road (Route 106)/West John Street
	7	Newbridge Road (Route 106)/Duffy Avenue
	—	Broadway (Route 107)/East John Street
	—	Bay Avenue/East Barclay Street/Woodbury Road
Malverne	—	Hempstead Avenue/Nassau Avenue/Francis
	—	Hempstead Avenue/Utterby Road
Long Beach	—	LIRR Parking Lot Exit/West Park Avenue
	—	LIRR Parking Lot Exit/West Park Avenue
	—	Center Street/West Park Avenue
	—	Edwards Boulevard/West Park Avenue
	—	Edwards Boulevard/West Park Avenue
Mineola	—	Mineola Boulevard/Old County Boulevard
	—	Mineola Boulevard/2nd Street
Port Washington	—	Main Street/LIRR Parking Entrance
	8	Main Street/Port Washington Boulevard
Valley Stream	—	South Franklin Avenue/Merrick Road
	—	South Franklin Avenue/West Hawthorne Avenue
	—	South Franklin Avenue/Sunrise Highway (Route 2)
Merrick	—	Merrick Avenue/Broadcast Plaza
	—	Merrick Avenue/Smith Street
	—	Merrick Avenue/Sunrise Highway
Suffolk County		
Babylon	—	Deer Park Avenue/Railroad Avenue
	—	Deer Park Avenue/Park Avenue
	—	Deer Park/Fire Island/West Main Street/East Main Street
Huntington	—	Executive Drive/Long Island Avenue
	—	Executive Drive/Pine Aire Drive
Port Jefferson	—	Main Street (25A)/LIRR Parking Entrance
	—	Main Street (25A)/North Country Road
Ronkonkoma	—	Hawkins Avenue/Union Avenue
	—	Hawkins Avenue/LIE North Service Road
	9	Hawkins Avenue/LIE South Service Road
	—	Ronkonkoma Avenue Ramp/LIRR Parking Lot
Queens County		
Sunnyside	—	Queens Boulevard/Van Dam Street/Thomson Avenue
	—	Queens Boulevard/Skillman Avenue
	—	Queens Boulevard/Jackson Avenue/Queens Plaza East
	—	Northern Boulevard/Queens Plaza North/41st Avenue
Bayside	10	Northern Boulevard/Bell Boulevard
	—	Bell Boulevard/41st Avenue

Note: The five receptor sites (6-10) selected for detailed microscale analysis are indicated as shown.

complicated physical phenomenon as closely as possible. However, because all models contain simplifications and approximations of actual conditions and interactions, and because a worst-case condition is of most relevance, most of these dispersion models are conservative and tend to overpredict pollutant concentrations, particularly under adverse meteorological conditions.

The CO analysis for this project uses a modeling approach approved by EPA that has been widely employed for evaluating air quality impacts of projects in New York City, New York State, and throughout the country, and has coupled this approach with a series of worst-case assumptions relating to meteorology, traffic, background concentration levels, etc. This combination results in a conservative estimate of expected CO concentrations and resulting air quality impacts caused by the project.

DISPERSION MODELS FOR MICROSCALE ANALYSES

At all sites selected for analysis, maximum 1- and 8-hour average CO concentrations were determined using EPA's CAL3QHC model, Version 2.0, (*User's Guide to CAL3QHC, A Modeling Methodology for Predicting Pollutant Concentrations Near Roadway Intersections*, Office of Air Quality Planning and Standards, U.S. Environmental Protection Agency, Research Triangle Park, North Carolina, September 1995). The CAL3QHC model is a Gaussian model, which assumes that the dispersion of pollutants downwind of a pollution source follows a Gaussian (or normal) distribution, and is used for predicting CO concentrations along roadway segments.

WORST-CASE METEOROLOGICAL CONDITIONS

In general, the transport and concentration of pollutants from vehicular sources are influenced by three principal meteorological factors: wind direction, wind speed, and atmospheric stability, which accounts for the effects of dispersion or mixing in the atmosphere.

CO computations were performed using a wind speed of 1 meter/second, and stability class D, representative of neutral conditions in New York City and Long Island. For sites in midtown Manhattan, a persistence factor of 0.77 for the 8-hour period was selected. Sites in Queens and on Long Island were analyzed using a persistence factor of 0.7. The persistence factor takes account of the fact that over 8 hours, traffic parameters will fluctuate downward from the peak and meteorological conditions will change, as compared with the 1-hour values. Based on the latest local guidance from the New York City Department of Environmental Protection (NYCDEP) dated March 1998, an ambient temperature of 50° Fahrenheit was assumed for the emissions computations in Manhattan and 43° Fahrenheit was used for the sites in Queens, Nassau, and Suffolk Counties. At each receptor location, the wind angle that maximized the pollutant concentrations was used in the analysis regardless of frequency of occurrence.

VEHICLE EMISSIONS DATA

To predict ambient concentrations of pollutants generated by vehicular traffic, emissions from vehicle exhaust systems must be estimated. Vehicular emissions were computed using the EPA-developed Mobile Source Emissions Model, MOBILE5B. For the Manhattan sites, emission estimates were made for six classes of motor vehicles:

- Light-duty, gasoline-powered automobiles;
- Light-duty, gasoline-powered taxis—new;
- Light-duty, gasoline-powered taxis—old police cars;
- Light-duty, gasoline-powered trucks;

Table 10-6
Representative Monitored Ambient Air Quality Data, Long Island

Pollutant	Location	Units	Period	Concentrations			Number of Exceedances of Federal Standard	
				Mean	Highest	Second Highest	Primary	Secondary
CO	Eisenhower Park	ppm	1-hour	—	8.5	8.4	0	0
			8-hour	—	4.9	4.7	0	0
SO_2	Eisenhower Park	ppm	Annual	0.005	—	—	0	—
			24-hour	—	0.031	0.029	0	—
			3-hour	—	0.072	0.059	—	0
	Babylon	ppm	Annual	0.006	—	—	0	—
			24-hour	—	0.031	0.029	0	—
			3-hour	—	0.051	0.046	—	0
Respirable Particulates (PM_{10})	Eisenhower Park	μg/m³	Annual	21	—	—	0	0
			24-hour	—	73	46	0	0
	Babylon		24-hour	19	—	—	0	0
				—	43	39	0	0
NO_2	Eisenhower	ppm	Annual	0.025	—	—	0	0
Lead	None	μg/m³	3-month	—	—	—	—	—
O_3	Babylon	ppm	1-hour	—	0.146	0.137	4	4

Source: *New York State Air Quality Report, Ambient Air Monitoring Systems*, Annual 1997 DAR-98-1.

As can be seen from the monitored data, in both areas, only the ozone standard continues to be exceeded. It should be noted, however, that in recent years, measured PM_{10} concentrations at the Madison Avenue site have exceeded the annual average standard and the 1997 levels are still extremely close to the NAAQS. Conversely, no violations of the CO standard have been recorded in the study area in quite a few years, even though New York City and Nassau County still retain their non-attainment designation for that pollutant.

C. PROBABLE IMPACTS OF THE PROJECT ALTERNATIVES

CARBON MONOXIDE ANALYSIS

A microscale CO analysis was performed for the year 2010. For CO modeling, 2010 is the critical analysis year since in later years, reduced vehicle emissions would yield lower predicted concentrations. For that reason, it was not necessary to study 2020 as well. The analysis followed the general modeling procedures that are discussed above. Vehicular traffic estimates, which are outlined in Chapter 9, "Transportation," were employed in the air quality mobile source modeling. Table 10-7 shows the results of this analysis for the No Action and Preferred Alternatives. The TSM Alternative would not generate significant vehicular activity, and was therefore not subject to full microscale analysis.

No 1-hour values are shown since predicted concentrations are far below the respective standard. In addition, 8-hour values are the most critical for impact assessment. The values shown for CAL3QHC modeling are the highest predicted concentrations for each receptor location.

methodology is based on three criteria—Intersection Level of Service (LOS), Traffic Volumes, and the number of project-generated vehicles expected to travel through the intersection.

As described in Chapter 9, "Transportation," the traffic study area in Manhattan surrounding GCT extended from Seventh Avenue to First Avenue along 42nd Street and included all the intersections between Fifth and Third Avenues from 48th Street to 40th Street. Several of these intersections met the City Environmental Quality Review (CEQR) revised screening criteria of 25 or more new project-generated trips. Of these, representative intersections were selected based on a combination of worst LOS (D or worse), and largest proportions of overall volumes and project-generated trips. The air quality receptor sites in the GCT area selected for microscale analysis are shown in Table 10-3.

Table 10-3

Mobile Source Receptor Locations, GCT Area

Receptor Site	Location
1	Madison Avenue/48th Street
2	Park Avenue/48th Street
3	Park Avenue/42nd Street
4	Lexington Avenue/45th Street
5	Third Avenue/48th Street

Based on NYSDOT's EPM capture criteria, a 10 percent or more increase in traffic volume by approach on affected roadways would trigger microscale analysis at the sites on Long Island. The future 2010 volumes at the intersections analyzed as part of the traffic study were found to have less than a 10 percent increase in volume between the No Action and Preferred Alternative conditions, for all study areas in Nassau and Suffolk Counties. The CEQR revised criteria of 10 or more new project-generated trips in Long Island City and 100 or more new trips in the rest of Queens were also not met. Although the screening criteria were not met for these intersections, representative sites were chosen to assess the potential localized impacts due to the Preferred Alternative in these study areas. The candidate intersections were ranked based on worst LOS (D or worse) and largest overall traffic volume. Of these, the intersections receiving the largest fraction of project-generated trips in the study area were chosen for analysis. Table 10-4 presents the intersections included in the traffic study in Queens and on Long Island (as described in Chapter 9, "Transportation"), and indicates the intersections selected for the Air Quality Study based on the methodology described above.

As discussed in Chapter 9, very few trips were generated in the Sunnyside area in Queens, and therefore an air quality study in this area was not warranted.

The receptor sites selected for analysis represent the worst traffic conditions and the largest increase in project-generated traffic in each study area, and therefore are the locations where the greatest air quality impacts and maximum changes in the CO concentrations would be expected. Multiple receptor sites were modeled at each of these intersections (i.e., receptors were placed along the approach and departure links at spaced intervals). The AM and PM peak periods were analyzed for the sites in Queens and on Long Island. For the Manhattan sites, the AM, midday (MD), and PM peak periods were analyzed.

REGIONAL (MESOSCALE) POLLUTANT IMPACTS

A mesoscale analysis is typically performed by computing pollutant burdens within a project's overall study area. Pollutant burdens represent total expected quantities of pollutant emissions for a region for a defined time period. Pollutant burdens were computed for the annual quantities of CO, VOCs, NO_x, and PM_{10} that would be emitted due to changes in vehicular activity within the entire study area. Vehicular pollutant burdens were computed based on the most recent EPA vehicle emission estimating procedures, MOBILE5B (for CO, VOCs, and NO_x), PART 5 (for PM_{10}), and on the changes in vehicle miles traveled (VMT) for the analysis year (2010).

Pollutant burdens provide an indication of the general change in air quality. They are particularly useful for assessing the relative change in the concentration of the reactive air pollutants—hydrocarbons and NO_x—and resultant concentrations of photochemical oxidants (ozone). In addition, CO burdens are examined to determine the general effect of changes in vehicular activity on background levels of this pollutant.

Changes in VMT within the network were based on the project's transportation model (described in Chapter 9, "Transportation"). Vehicular speeds for each county were based on information in NYSDEC's SIP emissions inventory. For each pollutant, an appropriate temperature is used to compute the various speed-dependent emission factors. For CO, 50° Fahrenheit was used for Manhattan and 43° Fahrenheit for Queens, Kings, Bronx, Nassau, and Suffolk Counties. For VOCs and NO_x, 78.3° Fahrenheit was used for all counties, reflecting the summer ozone season. The emission factors for rail diesel locomotives were based on the estimated controlled emission rates for locomotives manufactured in 1973-2001 (Tier 0) from EPA 420-F-97-048. Table 10-8 presents the results of the regional pollutant analysis.

Table 10-8

Regional Mobile Source Pollutant Burdens Relative to the No Action Alternative

	Incremental Pollutant Burdens (tons per year)							
	Preferred Alternative				TSM Alternative			
Vehicle Class	CO	VOCs	No_x	PM_{10}	CO	VOCs	No_x	PM_{10}
Motor Vehicle								
Queens	-149.0	-50.4	-28.5	-21.1	-41.8	-14.1	-8.0	-5.9
Nassau	-136.0	-45.7	-24.8	-18.6	-49.1	-16.5	-9.0	-6.7
Suffolk	-30.2	-10.9	-6.3	-4.7	-27.1	-9.8	-5.7	-4.2
New York	-182.9	-36.0	-10.4	-7.4	-24.1	-4.8	-1.4	-1.0
Brooklyn	1.1	0.4	0.2	0.2	-3.3	-1.2	-0.7	-0.5
Bronx	-63.1	-21.5	-12.2	-9.0	-6.7	-2.3	-1.3	-1.0
Other	1.5	0.4	0.2	0.2	-1.2	-0.35	-0.2	-0.1
Total Motor Vehicle	-558.6	-163.7	-81.8	-60.5	-153.3	-49.0	-26.2	-19.4
Commuter Rail/Diesel	-5.2	-2.0	-35.0	-1.3	10.3	3.9	69.1	2.6
TOTAL	**-563.8**	**-165.6**	**-116.7**	**-61.8**	**-143.0**	**-45.1**	**43.0**	**-16.8**

PARKING FACILITIES

Parking analyses were performed using the methodology set forth in the *CEQR Technical Manual*, to assess the potential effects on ambient CO concentrations from parking facilities adjacent to the intersections studied in Queens and on Long Island. Emissions from vehicles entering, parking and exiting the parking facilities were estimated using EPA's MOBILE5B mobile source emissions model at an ambient temperature of 43° Fahrenheit. For all arriving and departing vehicles, an average speed of 5 miles per hour was conservatively assumed for travel within the parking facilities. In addition, all vehicles were assumed to idle for 1 minute before proceeding to the exit. These parking facilities were modeled as additional line sources and were included in the CAL3QHC modeling.

B. EXISTING CONDITIONS

EXISTING MONITORED AIR QUALITY CONDITIONS (1997)

Monitored concentrations of CO, SO_2, PM_{10}, NO_2, lead, and ozone ambient air quality data for the New York City area are shown in Table 10-5, while Table 10-6 shows data for Nassau and Suffolk counties. These values are the most recent monitored data available that have been published by NYSDEC for these locations.

Table 10-5

Representative Monitored Ambient Air Quality Data, New York City

Pollutant	Location	Units	Period	Concentrations			Number of Exceedances of Federal Standard	
				Mean	Highest	Second Highest	Primary	Secondary
CO	Bloomingdale's	ppm	8-hour	—	6.2	6.1	0	0
			1-hour	—	18.0	13.6	0	0
	225 E. 34th Street	ppm	8-hour	—	4.1	3.8	0	0
			1-hour	—	6.3	6.1	0	0
SO_2	P.S. 59—Midtown	ppm	Annual	0.012	—	—	0	—
			24-hour	—	0.041	0.040	0	—
			3-hour	—	0.066	0.066	—	0
	Queens College	ppm	24-hour	0.005	—	—	0	—
				—	0.029	0.022	0	—
				—	0.043	0.042	—	0
Respirable Particulates (PM_{10})	Madison Avenue and 46th Street	µg/m³	Annual	46	—	—	0	0
			24-hour	—	105	101	0	0
	P.S. 59	µg/m³	Annual	31	—	—	0	0
			24-hour	—	60	59	0	0
NO_2	P.S. 59	ppm	Annual	0.040	—	—	0	0
Lead	Madison Avenue	µg/m³	3-month	—	0.060	0.060	0	0
O_3	Queens College	ppm	1-hour	—	0.147	0.135	2	2

Source: *New York State Air Quality Report, Ambient Air Monitoring Systems*, Annual 1997 DAR-98-1.

Table 10-9
Maximum Predicted 8-Hour Average Carbon Monoxide Concentrations in 2010 for Proposed Traffic Mitigation Measures

Receptor Site	Location	Time Period	No Action	Preferred Alternative	Preferred Alternative with Mitigation
1	Madison Avenue/48th Street	MD	6.7	7.8	6.8
2	Park Avenue/48th Street	AM	7.3	7.2	7.0
3	Park Avenue/42nd Street	PM/MD	6.6/6.4	6.7/6.4	6.6/6.7
4	Lexington Avenue/45th Street	MD/AM	7.8/6.2	7.9/6.1	—/6.1
5	Third Avenue/48th Street	MD	6.7	6.8	6.8
6	Middle Neck Road/North Station Plaza	AM	4.8	4.8	4.8
7	Newbridge Road (Route 106)/Duffy Avenue	AM	6.6	6.7	6.7
8	Main Street/Port Washington Boulevard	AM	4.5	4.5	4.6
9	Hawkins Avenue/LIE South Service Road	AM and PM	4.8	4.8	4.8
10	Northern Boulevard/Bell Boulevard	AM	4.8	4.9	4.8

Note: For locations where the maximum predicted 8-hour average CO concentrations do not occur in the same time period as in the No Action and Preferred Alternatives, the concentrations for both time periods are given.

CONSISTENCY WITH THE NEW YORK STATE AIR QUALITY IMPLEMENTATION PLAN

The Preferred Alternative would not result in any new violations of National Ambient Air Quality Standards or significant adverse air quality impacts at any of the receptor sites analyzed. Since those receptor sites were chosen to represent the greatest traffic impacts, and therefore the greatest potential for air quality impacts, the analysis thus demonstrates that the project would not result in violations of air quality standards or significant air quality impacts at other locations in the study area as well. For a discussion of the potential for air quality impacts during construction, see Chapter 17, "Construction and Construction Impacts."

The mesoscale analysis predicts that lower pollutant burdens of CO, VOCs, NO_x, and PM_{10} would result with the Preferred Alternative, which would therefore conform to the purpose of the SIP and the 1990 Clean Air Act Amendments (CAAA). For the TSM Alternative, lower pollutant burdens are predicted for CO, VOCs, and PM_{10}. NO_x emissions would increase slightly as a result of increased commuter rail/diesel activity within the study area. ❖

Table 10-7
Maximum Predicted 8-Hour Average Carbon Monoxide Concentrations in 2010

Receptor Site	Location	Time Period	No Action	Preferred Alternative
1	Madison Avenue/48th Street	MD	6.7	7.8*
2	Park Avenue/48th Street	AM	7.3	7.2
3	Park Avenue/42nd Street	PM	6.6	6.7
4	Lexington Avenue/45th Street	MD	7.8	7.9
5	Third Avenue/48th Street	MD	6.7	6.8
6	Middle Neck Road/North Station Plaza	AM	4.8	4.8
7	Newbridge Road (Route 106)/Duffy Avenue	AM	6.6	6.7
8	Main Street/Port Washington Boulevard	AM	4.5	4.5
9	Hawkins Avenue/LIE South Service Road	AM and PM	4.8	4.8
10	Northern Boulevard/Bell Boulevard	AM	4.8	4.9

Notes:

* Significant impact

The TSM Alternative was not subject to microscale air quality modeling due to the small number of trips generated as part of this alternative.

CO concentrations were predicted for project alternatives only at receptor sites where localized traffic conditions are expected to change because of those alternatives.

The 8-hour NAAQS for CO is 9 ppm.

NO ACTION ALTERNATIVE

As shown in Table 10-7, the future (2010) maximum predicted 8-hour average CO concentrations for the No Action Alternative are below the 8-hour NAAQS of 9 ppm at all receptor sites analyzed.

PREFERRED ALTERNATIVE

As shown in Table 10-7, the maximum predicted 8-hour average CO concentrations for the 2010 Preferred Alternative are less than the 8-hour NAAQS of 9 ppm at all receptor sites. However, at Receptor Location 1: Madison Avenue/48th Street, the incremental increase over the No Action conditions would be greater than 0.5 ppm, which, for receptor sites located in Manhattan's CBD, is considered a significant impact requiring mitigation. As shown below in section D, "Mitigation Measures," the mitigation measures proposed at this receptor location would considerably reduce the predicted 8-hour CO concentrations. The resulting incremental increase would be less than 0.5 ppm over the No Action condition.

TSM ALTERNATIVE

As described earlier, the TSM Alternative would not generate significant vehicular activity or affect traffic conditions significantly in the Manhattan study area. Consequently, it would be expected that CO concentrations in Manhattan would be similar to the No Action levels. At sites on Long Island, it would be expected that CO levels would be higher than No Action levels, but lower than Preferred Alternative levels due to some increased LIRR ridership.

noise receptors are located in close proximity to the existing rail track, and consequently rail noise was evaluated using the general and detailed noise assessment methodologies.

The following section discusses: noise fundamentals, standards, and impact criteria; general noise assessment methodology; detailed noise analysis methodology; existing noise levels, and noise levels for the project alternatives.

NOISE FUNDAMENTALS, STANDARDS, AND IMPACT CRITERIA

NOISE FUNDAMENTALS

Quantitative information on the effects of airborne noise on people is well documented. If sufficiently loud, noise may adversely affect people in several ways. For example, noise may interfere with human activities, such as sleep, speech communication, and tasks requiring concentration or coordination. It may also cause annoyance, hearing damage, and other physiological problems. Several noise scales and rating methods are used to quantify the effects of noise on people. These scales and methods consider such factors as loudness, duration, time of occurrence, and changes in noise level with time. However, it must be remembered that all the stated effects of noise on people vary greatly with the individual.

Sound is a fluctuation in air pressure. Sound pressure levels are measured in units called "decibels" (dB). The particular character of the noise that we hear (a whistle compared with a French horn, for example) is determined by the speed, or "frequency," at which the air pressure fluctuates, or "oscillates." Frequency defines the oscillation of sound pressure in terms of cycles per second. One cycle per second is known as one Hertz (Hz). People can hear over a relatively limited range of sound frequencies, generally between 20 and 20,000 Hz, and the ear does not perceive all frequencies equally well. High frequencies (that whistle, for example) are more easily discerned and therefore more intrusive than many of the lower frequencies (the lower notes on the French horn, for example).

"A"-Weighted Sound Level (dBA)

To bring a uniform noise measurement that simulates people's perception of loudness and annoyance, the decibel measurement is weighted to account for those frequencies most audible to the human ear. This is known as the A-weighted sound level, or "dBA," and it is the most often used descriptor of noise levels where community noise is the issue. As shown in Table 11-1, the threshold of human hearing is defined as 0 dBA; very quiet conditions (as in a library, for example) are approximately 40 dBA; levels between 50 dBA and 70 dBA define the range of acceptable daily activity; levels above 70 dBA would be considered noisy, loud, intrusive, and deafening as we move up the scale to 130 dBA. In considering these values, it is important to note that the dBA scale is logarithmic, meaning that each increase of 10 dBA describes a doubling of sound pressure. Thus, the background noise in an office, at 50 dBA, is perceived as twice as loud as a library at 40 dBA. In order for most people to perceive an increase in noise, it must be at least 3 dBA. At 5 dBA, the change will be readily noticeable.*

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* Average ability to perceive changes in noise levels from Bolt Beranek and Neuman, Inc., *Fundamentals and Abatement of Highway Traffic Noise. Report No. PB-222-703.* Prepared for the Federal Highway Administration, June 1973.

PARTICULATE IMPACTS FROM YARD ACTIVITY

An assessment was conducted to determine if the Preferred Alternative would result in any adverse air quality effects from the relocation of NYAR and/or MNR's Madison Yard. With respect to possible increases in pollutant levels in the vicinity of the new or reconstructed yard facilities, the main concern would be PM_{10} emissions from operations or idling of diesel locomotives. At Highbridge Yard, the ESA Project would provide for the midday storage of electric trainsets only, since these are being displaced from the lower level of GCT. In terms of NYAR operations, only Blissville Yard would experience an increase in diesel locomotive operations. Based on discussions with NYAR and an analysis of their operating needs, it is expected that one train a day would operate out of Blissville. This train would be equipped with one or two diesel locomotives operating for a period of approximately 4 hours throughout the yard. Since the nearest sensitive receptor is approximately 400 feet away, this level of diesel activity would not result in a measurable change in ambient levels of PM_{10} and therefore would not result in any significant impacts.

Although the Maspeth Yard may be used as an alternate location for freight car storage, train operations in the future with or without the Preferred Alternative would be the same—i.e., two freight trains per day. Therefore, there would be no increase in locomotive diesel emissions at Maspeth.

HVAC SYSTEM

Option 2 of the Preferred Alternative would require a cooling plant and air handling system to maintain passenger comfort at the below grade mezzanine and cross passages. This plant would be located at the new structure on 44th Street. The plant would be equipped with either air- or water-cooled chillers, cooling towers (if water chilled) and several air handling units. The equipment would be powered with either electricity or natural gas supplied by Con Edison. With natural gas the main pollutant of concern is nitrogen dioxide and concentrations of this pollutant are below NAAQS in the vicinity of the project. The exhaust from the gas-fired system would be placed on the roof of the new structure in accordance with the applicable air quality pollution control requirements for similar HVAC systems in New York City. The exhaust would be placed to avoid impacting any sensitive receptors, including the adjacent buildings' ventilation system.

D. MITIGATION MEASURES

An analysis was performed to determine the effect of the proposed traffic mitigation measures, discussed in Chapter 9, "Transportation," on maximum predicted CO concentrations at each microscale intersection where changes were recommended. As discussed above, the air quality analysis identified one significant adverse air quality impact, at Receptor Site 1: Madison Avenue/48th Street. This impact would be mitigated through the implementation of the proposed traffic mitigation measures. As shown in Table 10-9, the analysis concluded that with the traffic mitigation measures in place, no significant air quality impacts would result from the Preferred Alternative.

descriptors such as L_1, L_{10}, L_{50}, L_{90}, and L_x are sometimes used to indicate noise levels that are exceeded 1, 10, 50, 90, and x percent of the time, respectively. Discrete event peak levels are given as L_{01} levels.

The relationship between L_{eq} and levels of exceedance is worth noting. Because L_{eq} is defined in energy rather than straight numerical terms, it is not simply related to the levels of exceedance. If the noise fluctuates very little, L_{eq} will approximate L_{50} or the median level. If the noise fluctuates broadly, the L_{eq} will be approximately equal to the L_{10} value. If extreme fluctuations are present, the L_{eq} will exceed L_{90} or the background level by 10 or more decibels. Thus, the relationship between L_{eq} and the levels of exceedance will depend on the character of the noise. In community noise measurements, it has been observed that the L_{eq} is generally between L_{10} and L_{50}. The relationship between L_{eq} and exceedance levels is used to characterize the noise sources and to determine the nature and extent of their impact at all receptor locations.

A descriptor for cumulative 24-hour exposure is the day-night sound level, abbreviated as L_{dn}. This is a 24-hour measure that accounts for the moment-to-moment fluctuations in A-weighted noise levels due to all sound sources during 24 hours, combined. Mathematically, the L_{dn} noise level is the average of all $L_{eq(1)}$ noise levels over a 24-hour period, where nighttime noise levels (10 PM to 7 AM) are increased by 10 dBA before averaging.

Following FTA guidance, the maximum 1-hour equivalent sound level ($L_{eq(1)}$) or the day-night sound level (L_{dn}) is used for impact assessment, depending on land use category as described below.

NOISE STANDARDS AND CRITERIA

Noise levels associated with the operation of the alternatives under consideration as part of the ESA Project are subject to the noise standards defined by FTA.

In April 1995, FTA issued its report, *Transit Noise and Vibration Impact Assessment*, as a guideline for the evaluation of noise and vibration levels resulting from mass transit projects, and the assessment of impacts that result. The noise analysis methodology in the FTA report determines operational noise impacts that result from mass transit projects based on peak-hour $L_{eq(1)}$ and 24-hour L_{dn} noise levels, depending on the land use category of the affected areas near mass transit projects. Table 11-2 describes the land use categories defined in the FTA report, and noise metrics used for determining operational noise impacts. Figure 11-1 shows FTA's noise impact criteria for transit projects. The difference between "Severe Impact" and "Impact" is that the former denotes a change in noise level that a significant percentage of people would find annoying while the latter is indicative of a change in noise level noticeable to most people but not necessarily sufficient to result in strong adverse reactions from the community.

GENERAL NOISE ASSESSMENT

INTRODUCTION

The FTA general noise assessment methodology, contained in the FTA guidance manual was used to determine the potential for significant project noise impacts from a) increased train service at sensitive locations on Long Island and Queens and b) relocation of MNR and NYAR operations to alternate locations in the Bronx and Queens.

A. INTRODUCTION

This chapter assesses the potential for noise and vibration impacts from operation of the proposed MTA/LIRR East Side Access (ESA) Project. Noise and vibration during construction are assessed separately in Chapter 17, "Construction and Construction Impacts."

Operation of the project could affect noise and vibration levels in a number of ways. In Manhattan, new rail service in a tunnel beneath existing residential and commercial buildings could increase vibration and ground-borne noise levels in those structures. In Queens, portions of the new tunnel along 41st Avenue in close proximity to existing structures require analysis of potential changes to existing levels. In addition, increased rail service through the approaches of the 63rd Street Tunnel that pass under developed portions of Manhattan and Queens may also result in increased vibration levels at nearby structures.

The project's Preferred Alternative will allow the LIRR to increase train service throughout Long Island and Queens. This additional service would increase train passbys along most branches, creating a potential for adverse noise impacts at sensitive locations along the right-of-way.

In addition, the relocation of the MNR Madison Yard operations to Highbridge Yard and the relocation of the New York & Atlantic Railway (NYAR) freight operations from Yard A to alternate locations may result in adverse noise impacts at adjacent sites.

Each of these issues are addressed in the following sections of the chapter. This chapter examines the potential for impacts related to noise and vibration in two sections: B, "Noise," and C, "Vibration." Each of these sections includes a discussion of methodology and an evaluation of existing conditions and the future conditions predicted for the project alternatives.

B. NOISE

INTRODUCTION

The noise analysis for the proposed project was performed using procedures described in the Federal Transit Administration (FTA) guidance manual, *Transit Noise and Vibration Impact Assessment*, April 1995. This FTA guidance document provides a three-step process for analysis: a noise screening procedure, a general noise assessment methodology and a detailed noise analysis methodology. The screening procedure is used to determine whether any noise sensitive receivers are within distances where impacts are likely to occur; the general noise assessment methodology is used to determine locations (or in the case of this project rail segments) where there is the potential for impacts, and; the detailed noise analysis methodology is used to make a prediction of impact and assessment of the effectiveness of mitigation with greater precision than can be achieved with the general noise assessment. For this project, in terms of rail noise,

Table 11-1
Common Noise Levels

Sound Source	(dBA)
Military jet, air raid siren	130
Amplified rock music	110
Jet takeoff at 500 meters	100
Train horn at 30 meters	95
Freight train at 30 meters	90
Heavy truck at 15 meters	
Busy city street, loud shout	80
Busy traffic intersection	
Highway traffic at 15 meters, train	70
Predominantly industrial area	60
Light car traffic at 15 meters, city or commercial areas or residential areas close to industry	
Background noise in an office	50
Suburban areas with medium density transportation	
Public library	40
Soft whisper at 5 meters	30
Threshold of hearing	0

Note: A 10 dBA increase in level doubles the apparent loudness, and a 10 dBA decrease halves the apparent loudness.
Source: Allee King Rosen & Fleming, Inc.

Effects of Distance on Noise

Noise will vary with distance. For example, at-grade rail transit at 50 mph at 50 feet will typically produce sound levels of approximately 75 dBA. The same noise will measure approximately 70.5 dBA at a distance of 100 feet. This decrease is known as “drop-off.” The outdoor drop-off rate for moving noise sources, such as traffic or rail transit, is a decrease of 4.5 dBA for every doubling of distance between the noise source and receiver. For stationary noise sources, such as amplified rock music, the outdoor drop-off rate is a decrease of 6.0 dBA for every doubling of distance between the noise source and receiver.

Noise Descriptors Used in Impact Assessment

Because the sound pressure level unit of dBA describes a noise level at just one moment and very few noises are constant, other ways of describing noise over more extended periods have been developed. One way of describing fluctuating sound is to describe the fluctuating noise heard over a specific period as if it had been a steady, unchanging sound. For this condition, a descriptor called the "equivalent sound level," L_{eq}, can be computed. L_{eq} is the constant sound level that, in a given situation and period (e.g., 1 hour, denoted by $L_{eq(1)}$, or 24 hours, denoted as $L_{eq(24)}$), conveys the same sound energy as the actual time-varying sound. Statistical sound level

Table 11-3
LIRR Branch Segment Representation

LIRR Station of Analysis	Represents Branch Segment Between
Flatbush Avenue	Flatbush Avenue and Jamaica
Jamaica	Sunnyside and Jamaica
Great Neck	Main Line and Port Washington
Valley Stream	Jamaica and Valley Stream
Floral Park	Jamaica and Floral Park
Hempstead	Floral Park and Hempstead
Far Rockaway	Valley Stream and Far Rockaway
Long Beach	Valley Stream and Long Beach
West Hempstead	Valley Stream and West Hempstead
Mineola	Floral Park and Mineola
Oyster Bay	Mineola and Oyster Bay
Hicksville	Mineola and Hicksville
Huntington	Hicksville and Huntington
Port Jefferson	Huntington and Port Jefferson
Babylon	Valley Stream, Bethpage, and Babylon
Ronkonkoma	Bethpage and Ronkonkoma
Patchogue	Babylon and Montauk

service plan is not demand-driven, it was assumed that existing and 2020 train consists for off-peak hours are the same. When averaged over a 24-hour period, the future 2020 values for the day-night analysis were assumed to be the same as those in existing conditions. In all cases, diesel trainsets were assumed to consist of one operating locomotive (dual-mode train sets are equipped with two locomotives only one of which operates at a given time).

A ballasted, welded rail was assumed along all branch segments. The thresholds of impact for each land use category were determined based on calculated existing noise levels using Figure 11-1. Noise exposures were calculated at a reference distance of 50 feet from the track using the following equations.

For Locomotives:

$$L_{eq_L}(h) = SEL_{ref_L} + 10\log(N_{locos}) - 10\log(S/50) + 10\log(V) - 35.6$$

For Rail Cars:

$$L_{eq_c}(h) = SEL_{ref_c} + 10\log(N_{cars}) + 20\log(S/50) + 10\log(V) - 35.6$$

where the following adjustments were used where applicable:

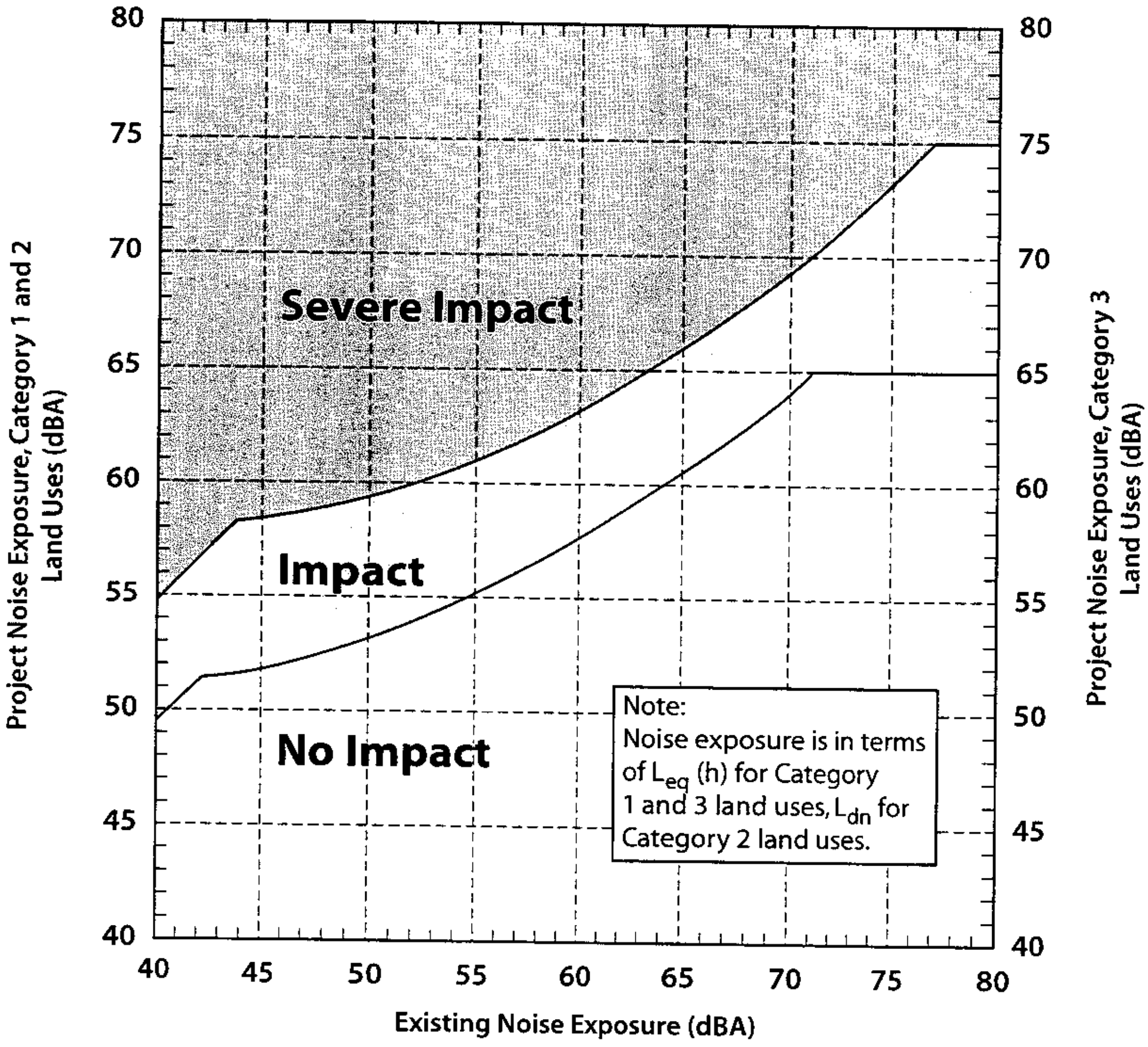
and where:

N_{locos} = average number of locomotives per train

N_{cars} = average number of cars per train

T = average throttle setting of diesel-electric locomotive

S = train speed, in miles per hour



Source: Transit Noise and Vibration Impact Assessment, DOT-T-95-16, April 1995

Figure 11-1

FTA's Noise Impact Criteria for Transit Projects

Table 11-4

General Noise Assessment Results by Location, Peak Hour (8 to 9 AM), 50 feet from Track Centerline

Segment	Existing Peak Hour Noise Level L_{eq} (dBA)	Land Use Category 1 Threshold of Impact L_{eq} (dBA)	Land Use Category 3 Threshold of Impact L_{eq} (dBA)	Peak Hour Project Increment L_{eq} (dBA)	Potential Impacts of the Preferred Alternative by Land Use Category	Onset of Impact from Centerline (feet)
Flatbush Avenue	67	62	67	61	No Impact	—
Jamaica	71	65	70	68	1	100
Great Neck	60	58	63	59	1	65
Valley Stream	71	65	70	65	No Impact	—
Floral Park	71	65	70	68	1	100
Hempstead	57	56	61	51	No Impact	—
Far Rockaway	52	54	59	47	No Impact	—
Long Beach	55	55	60	48	No Impact	—
West Hempstead	52	54	59	46	No Impact	—
Mineola	70	65	70	68	1	100
Oyster Bay	64	60	65	61	1	65
Hicksville	70	65	70	67	1	80
Huntington	68	63	68	64	1	65
Port Jefferson	67	62	67	59	No Impact	—
Babylon	68	63	68	62	No Impact	—
Ronkonkoma	64	60	65	62	1	80
Patchogue	65	61	66	59	No Impact	—

Notes: Noise levels shown are rounded to the nearest decibel.
Threshold of Impact indicates impact at greater than or equal to (≥) the value presented.

In terms of sensitive land uses, the expressway and river form barriers between the yard and surrounding residential uses. The nearest residential use is approximately 400 feet from the center of the yard. Potential impacts were assessed for the midday storage of electric train sets for MNR's commuter operations.

Fresh Pond Yard is located at the junction of the LIRR Montauk Branch and the Conrail Connector to the LIRR Bay Ridge Branch, and is the center of NYAR's freight operations. The Preferred Alternative would provide for a new maintenance facility to replace NYAR's current building at Yard A. The new maintenance building would be approximately in the middle of the yard. Although land uses in the area are predominantly residential, the yard is bordered, for the most part, by a buffer of industrial uses (see Chapter 3, "Land Use, Zoning, and Public Policy," for a more detailed discussion of land uses in the area). The maintenance building would be more than 700 feet away from any residential use. The addition of this facility in an active rail yard would not result in any perceptible noise impacts at sensitive receptors.

Table 11-2
FTA's Land Use Category and Metrics for Transit Noise Impact Criteria

Land Use Category	Noise Metric (dBA)	Description of Land Use Category
1	Outdoor $L_{eq(h)}$*	Tracts of land where quiet is an essential element in the intended purpose. This category includes lands set aside for serenity and quiet, and such land uses as outdoor amphitheaters and concert pavilions, as well as National Historic Landmarks with significant outdoor use.
2	Outdoor L_{dn}	Residences and buildings where people normally sleep. This category includes homes, hospitals, and hotels, where a nighttime sensitivity to noise is assumed to be of utmost importance.
3	Outdoor $L_{eq(h)}$*	Institutional land uses with primarily daytime and evening use. This category includes schools, libraries, and churches, where it is important to avoid interference with such activities as speech, meditation, and concentration on reading material. Buildings with interior spaces where quiet is important—such as medical offices, conference rooms, recording studios, and concert halls—fall into this category. Places for meditation or study associated with cemeteries, monuments, museums. Certain historical sites, parks, and recreational facilities are also included.

Note: * L_{eq} for the noisiest hour of transit-related activity during hours of noise sensitivity.
Source: *Transit Noise and Vibration Impact Assessment*, FTA, April 1995.

INCREASED TRAIN SERVICE

The LIRR system consists of 10 branches and hundreds of miles of track. For purposes of the general noise assessment of increased train service, the system was divided into 17 segments. These segments were developed based on locations with comparable and contiguous train pass-bys. The segments and the stations are presented in Table 11-3. Segments with no change (or negative change) in the number of trains between existing and future 2020 conditions were not included in the analysis, since no noise impacts would occur at these locations. These included the segments between the main line and Hunterspoint Avenue, between Long Island City and Jamaica, and between Ronkonkoma and Greenport.

Methodology and Data Input

The general noise assessment methodology consists of determining the project noise exposure at 50 feet from the centerline of track and comparing the calculated levels (i.e., with the Preferred Alternative) with allowable levels based on existing noise levels and land use categories. Since the general noise assessment is used as a screening methodology to determine which locations would require a detailed investigation, it was assumed that somewhere along each branch or section of branch of the existing rail line, all land use categories may be present within 50 feet of the track centerline. Therefore, both the L_{dn} as well as the L_{eq} noise metrics were used in the analysis.

The average number of cars per train on each branch segment for existing conditions for both the peak hour and 24-hour analyses were based on current operational characteristics. The average number of cars per train on each branch segment for future 2020 peak hour conditions was predicted based on the future 2020 service plan, and estimated ridership. Since the off-peak

Methodology and Data Input

A general noise assessment analysis was conducted for Highbridge and Blissville using the procedures contained in the FTA guidance manual. At Highbridge, the analysis assessed the potential impacts of 11 electric train movements twice during the midday. At Blissville, the analysis was based on NYAR's operating requirements described above.

Using the FTA methodology, for 50 feet from the center of the site

$$L_{eq}(h) = SEL_{ref} + C_N - 35.6$$

$$L_{dn} = 10 \log [(15) \times 10^{(Leq(day)/10)} + (9) \times 10^{(Leq(night)+10/10)}] - 13.8$$

where

$C_N = 10 \log (N_T/20)$ for rail yards and shops

$C_N = 10 \log (2N_T)$ for layover tracks

N_T = Number of trains per hour

$SEL_{ref} = 118$ for rail yards and shops

$SEL_{ref} = 116$ for layover tracks

These values were adjusted for the appropriate distance.

Results

The analysis results are shown in Table 11-6, along with the allowable project noise levels based on the FTA criteria contained in Figure 11-1. Based on the results of the general noise assessment, the Preferred Alternative would not result in any adverse impacts at these locations.

Table 11-6

General Noise Assessment* (Yards)

	Existing Noise**	Allowable Project Noise	Predicted Noise Increment
Highbridge	65	60	55
Blissville	65	60	47

Notes:

* All values in L_{dn}.

** Based on Table 5-7, "Estimating Existing Noise Exposure for General Assessment," contained in the FTA guidance document, *Transit Noise & Vibration Impact Assessment*.

DETAILED NOISE ANALYSIS

INTRODUCTION

At the rail segments where the general noise assessment indicated the potential for impacts, a detailed noise analysis was performed in compliance with the procedures contained in the FTA guidance manual. The purpose of a detailed analysis is to make a prediction of impact and an assessment of the effectiveness of mitigation with greater precision than can be achieved with the general assessment methodology.

V = average hourly volume of train traffic, in trains per hour

V_d = average hourly daytime volume of traffic, in trains per hour or

= number of trains, 7 AM to 10 PM / 15

V_n = average hourly nighttime volume of traffic, in trains per hour or

= number of trains, 10 PM to 7 AM / 9

SEL_{ref} = reference SEL value, which equals 92 dBA for locomotives, and 82 for rail cars

Results

Table 11-4 shows the results of the general noise assessment for the peak hour, $L_{eq(1)}$, analysis. For FTA Category 1 land uses, as shown in Table 11-4, there are eight segments or locations where there are potential impacts due to the Preferred Alternative, and where, depending upon existing land uses, detailed noise analysis may be necessary. These segments are Jamaica, Great Neck, Floral Park, Mineola, Oyster Bay, Hicksville, Huntington, and Ronkonkoma. For FTA Category 3 land uses, as shown in the Table 11-4, there are no segments where there is the potential for impacts due to the Preferred Alternative.

Table 11-5 shows the results of the general noise assessment for the 24-hour, Ldn, analysis. For FTA Category 2 land uses, as shown in Table 11-5, the Preferred Alternative has the potential to result in significant noise impacts at six segments or locations—Valley Stream, Jamaica, Floral Park, Mineola, Hicksville, and Port Jefferson (see Figure 11-2). With the exception of Valley Stream, these locations represent a continuous portion of the LIRR system, from Sunnyside to the Port Jefferson station. With respect to Valley Stream, these potential impacts are predicted to occur because several lines converge at or just before this section of the system, and in the future, additional diesel trains are forecast to be present on the branch. The latter condition is not a direct result of the Preferred Alternative for ESA Project, but rather a consequence of the new dual-mode diesel locomotives which will enable diesel trains from the Montauk Branch to proceed into Manhattan. In the existing condition most diesel trains do not go west of Babylon.

RELOCATION OF YARD FACILITIES

As discussed in Chapter 2, "Project Alternatives," the Preferred Alternative would involve construction at three rail yards—Highbridge in the Bronx; and either Blissville or Maspeth, along with Fresh Pond in Queens. This section assesses the potential noise impacts associated with relocating the displaced MNR and NYAR existing operations from Grand Central Terminal's (GCT) Madison Avenue facility and Yard A, respectively.

Highbridge is an existing, partially used MNR yard situated between the Harlem River and the Major Deegan Expressway. The Preferred Alternative would construct storage and service tracks for six electric train sets at this location. In addition, a car appearance facility and an employee parking area would also be provided. While not part of the Preferred Alternative, MNR's future plans for the yard include five diesel storage and service tracks and an enclosed Train Washer Facility.

Table 11-5
General Noise Assessment Results by Location, Day-Night (7 AM to 10 PM, 10 PM to 7 AM), 50 feet from Track Centerline

Segment	Existing Day-Night Noise Level L_{dn} (dBA)	Land Use Category 2 Threshold of Impact L_{dn} (dBA)	Day-Night Project Increment L_{dn} (dBA)	Potential Impact/ No Impact of the Preferred Alternative	Onset of Impact from Centerline (feet)
Flatbush Avenue	72	65	60	No Impact	—
Jamaica	77	65	74	Impact	400
Great Neck	68	63	62	No Impact	—
Valley Stream	76	65	68	Impact	100
Floral Park	76	65	68	Impact	100
Hempstead	67	63	60	No Impact	—
Far Rockaway	62	59	52	No Impact	—
Long Beach	67	62	58	No Impact	—
West Hempstead	63	60	58	No Impact	—
Mineola	75	65	67	Impact	80
Oyster Bay	65	61	56	No Impact	—
Hicksville	75	65	67	Impact	80
Huntington	73	65	64	No Impact	—
Port Jefferson	67	62	65	Impact	100
Babylon	75	65	54	No Impact	—
Ronkonkoma	71	65	56	No Impact	—
Patchogue	66	62	57	No Impact	—

Notes:
Noise levels shown are rounded to the nearest decibel.
Threshold of Impact indicates impact at greater than or equal to (≥) the value presented.

Blissville Yard—a former rail yard located on the Montauk Branch—would serve as the main replacement for the NYAR's lost storage at Yard A. Four unelectrified tracks with a storage capacity of approximately 60 freight cars would be constructed. In addition, track connections to the Montauk Branch would be restored. The land uses surrounding the yard are entirely industrial, and the nearest residential use is more than 400 feet away with several intervening structures shielding use from the yard. In the future, it is expected that one train would use Blissville between 5 and 9 PM.

If required, additional storage for NYAR would be provided at Maspeth Yard, which is an active yard along the Montauk Branch 1¼ miles from Blissville Yard. While the area surrounding the yard is predominantly industrial, there are several residential uses just past the southern end of the yard. The new storage tracks would be constructed in the part of the yard (northwest of Maspeth Avenue) that is entirely surrounded by industrial uses. Currently, three trains per day operate out of this yard and in the future, it is not expected that this level of activity would be exceeded. In fact, based on current expectations, only two trains per day may utilize Maspeth Yard. Therefore, the Preferred Alternative would not increase noise exposure at this location.

Table 11-7
Noise Receptor Sites and Locations

Site	Location	Segment	FTA Land Use Category
1	Barnett Ave. between 46th & 48th Streets	Woodside to Jamaica	2
2	63rd Ave. between Alderton & Austin Streets	Woodside to Jamaica	2
3	Burns St. between Tennis Rd. & 69th Avenue	Woodside to Jamaica	1 & 2
4	175th St. between Archer & Douglas Avenues	Jamaica to Floral Park	2
5	Smith St between 119th & 129th Avenues	Jamaica to Valley Stream	2
6	Main St between Plainfield Ave. & Granger Street	Floral Park to Mineola	2
7	Post Av between Orchard & Madison Streets	Mineola to Hicksville	2
8	Kinkel St btwn Railroad Av e. & Broadway Street	Mineola to Hicksville	2
9	Commercial Street	Valley Stream to Babylon	1
10	Between Little East Neck Rd. & Wellwood Avenue	Farmingdale to Ronkonkoma	1
11	Rail Road between Cuba Rd. & Breen Avenue	Huntington to Port Jefferson	2
12	Bark St between Old Bridge Rd & Gilder Street	Huntington to Port Jefferson	2
13	End of Knob Hill Dr near Hilltop Dr.	Huntington to Port Jefferson	2
14	North Country btwn Lynam St. & Woodlawn Ave.	Huntington to Port Jefferson	2
15	End of Baylis Ave. near North Country Road	Huntington to Port Jefferson	2

Note: For definition of land use categories, see Table 11-2.

- Site 2 is located at the end of 63rd Avenue near the rail track in Rego Park, Queens. It is located adjacent to the Woodside to Jamaica segment, in a low-rise residential area with 2-story private houses. The rail tracks at this location are at-grade. The nearest residences are located approximately 90 feet from the tracks.
- Site 3 is located on Burns Street in Forest Hills, Queens. It is adjacent to the Woodside to Jamaica segment, in a high-rise residential area with 7-story apartment buildings. Besides residential uses, the Forest Hill Stadium, a FTA category 1 land use, is also adjacent to the tracks at this location. The rail tracks at this location are elevated approximately 10 feet above the street. The nearest residences are located approximately 95 feet from the tracks. Traffic from Burns Street contributes to the total ambient noise levels.
- Site 4 is located at the end of 175th Street in Jamaica, Queens. It is adjacent to the Jamaica to Floral Park segment, in a low-rise residential area with 2-story private houses. The rail tracks at this location are at two levels: at-grade and elevated approximately 15 feet. The nearest residences are located approximately 60 feet from the tracks.
- Site 5 is located at Smith Street in Jamaica, Queens. It is adjacent to the Jamaica to Valley Stream segment, in a low-rise residential area with 2-story private houses. The rail tracks at this location are elevated approximately 15 feet above grade. The nearest residences are located approximately 60 feet from the tracks.
- Site 6 is located at Main Street in the Village of Floral Park, in Nassau County. It is adjacent to the Floral Park to Mineola segment, in a low-rise residential area with 2-story private houses. The rail tracks at this location are elevated approximately 10 feet above grade. The nearest residences adjacent the track are approximately 55 feet from the tracks.

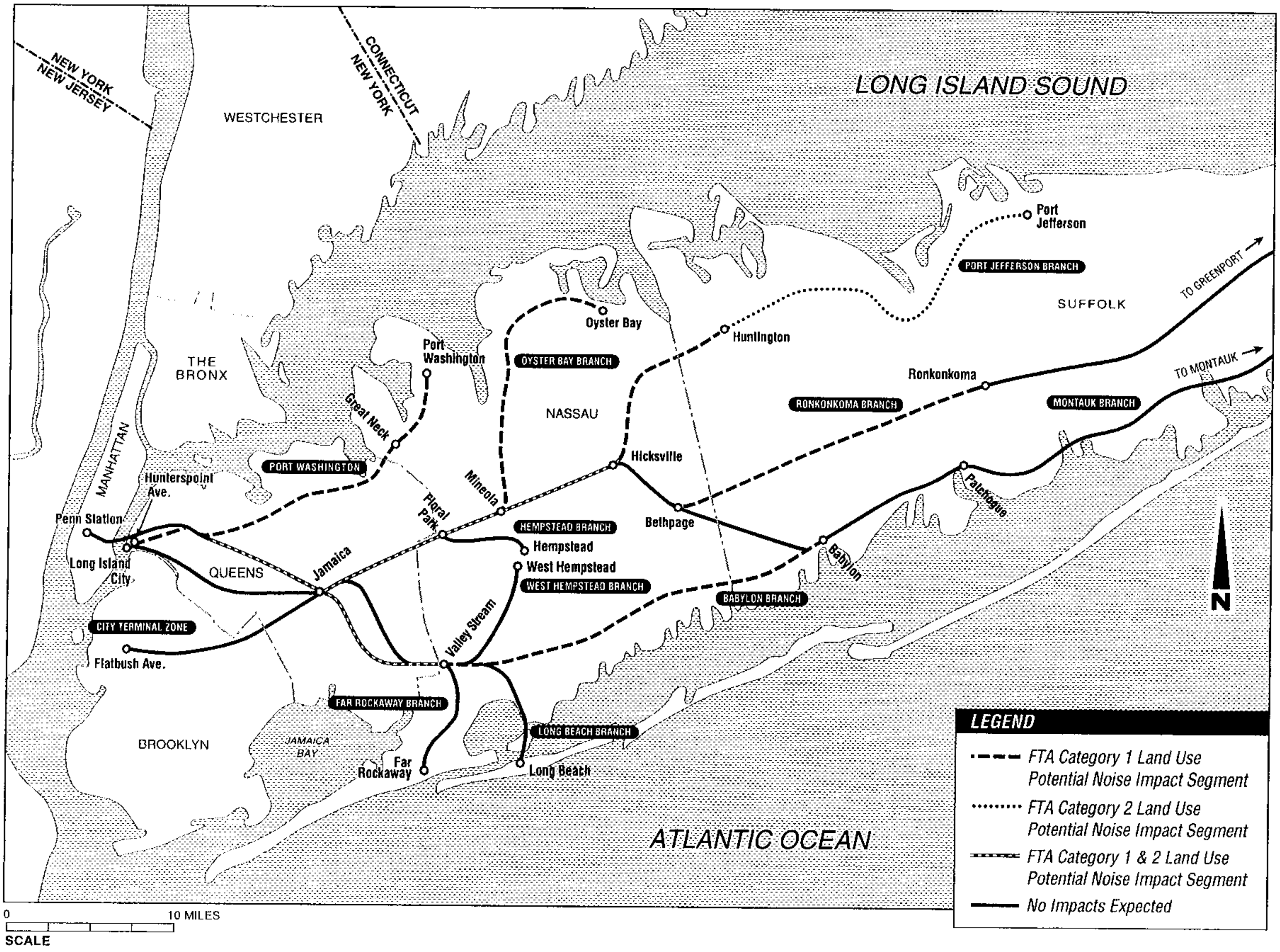


Figure 11-2

General Noise Assessment Results

Based on the results of the general noise assessment, a detailed noise analysis was carried out for the following rail segments—Woodside to Jamaica, Jamaica to Floral Park, and Jamaica to Valley Stream in Queens, Floral Park to Mineola; Mineola to Hicksville, and Valley Stream to Babylon in Nassau County; and Farmingdale to Ronkonkoma and Hicksville to Port Jefferson in Suffolk County.

NOISE PREDICTION METHODOLOGY

In general, the methodology utilized for the detailed noise analysis contained the following steps: on each of the analysis rail segments, noise-sensitive receptors sites which were near and adjacent to the railroad right-of-way were selected using Geographical Information Systems (GIS), aerial photographs, and field studies; noise measurement was performed at each receptor site to establish existing conditions; noise levels due to rail operations were calculated at each receptor site, using the calculation procedures contained in the FTA guidance document, for the project alternatives; noise levels due to non-rail noise sources at each receptor site were estimated by subtracting calculated existing rail noise from measured noise levels; the total future noise levels for each project alternative at each receptor site were calculated by adding rail noise to non-rail noise levels; project generated noise levels and project impacts at each receptor site were determined using the FTA impact criteria shown in Figure 11-1; and finally, at receptor sites where impacts or severe impacts were predicted to occur the feasibility of possible mitigation measures was examined.

SELECTION OF NOISE RECEPTOR SITES

Figure 11-3 and Table 11-7 show the locations of the 15 receptor sites selected for detailed analysis, and their FTA land use categories. The 15 sites selected are each adjacent to noise-sensitive land uses. Noise measurements were typically made at locations that were on public streets rather than on private property at residences, and adjusted based upon distance from the track to reflect the noise levels at the closest appropriate receptor site to the railroad right-of-way. They were selected based initially on an examination of GIS data for the rail segments which were previously identified as having the potential for project impacts. No category 1 sites were identified adjacent to the Port Washington Branch, Oyster Bay Branch, or between Hicksville and Huntington stations. Field studies were then performed to confirm that each site has a sensitive land use, that rail noise is the dominant noise source, and that each site is generally the closest sensitive receptor location to the rail tracks. Based on the above criteria, each receptor site should yield maximum project impacts (i.e., other potential receptor sites in the general location of the selected receptor sites, would be expected to have smaller project impacts than the selected receptor sites). In addition, the 15 sites were selected to provide geographic coverage of the areas that may potentially be impacted by the proposed project (i.e., they were spread over the various segments of the rail line potentially impacted by the proposed project).

The following is a brief description of each of the receptor sites:

- Site 1 is located at Barnett Avenue in Sunnyside, Queens. It is located adjacent to the Woodside to Jamaica segment, in a historical residential area with 2-story private houses, as well as some 7-story apartment buildings. The rail tracks at this location are at-grade. The nearest residences are located approximately 90 feet from the tracks. The receptor was shielded by some garage structures from the tracks. Traffic from Barnett Avenue contributes to the total ambient noise levels.

NOISE MONITORING

At each of the 15 receptor sites noise levels were measured to determine existing L_{dn} and/or $L_{eq(1)}$ noise levels. Measurements were made during September, October, and early November 1999. For residential land uses, full 24-hour measurements were made during a typical weekday, between noon Monday and noon Friday. For non-residential land uses, peak hour measurements were made during the weekday hour when maximum rail activity occurs.

With the exception of sites 9 and 10, 24-hour noise monitoring was conducted using a Brüel & Kjær Noise Level Analyzer Type 4427, a Brüel & Kjær Sound Level Calibrator Type 4230, a Brüel & Kjær ½-inch microphone Type 4133, and a Brüel & Kjær microphone preamplifier Type 2619. Measurements at these location were made on the A-scale (dBA) for a sampling period of 1 hour, throughout a 24-hour measurement period. At sites 9 and 10, 60-minute noise monitoring was conducted using a Larson Davis Labs (LDL) Model MK224 microphone connected to an LDL preamplifier attached to an LDL Model 700 Type 1 (according to ANSI Standard S1.4-1983) sound level meter, and using a with a Brüel & Kjær Type 4230 sound level calibrator using the appropriate adaptor

For both the 24-hour and 1-hour measurements, the noise analyzer was mounted at a height of approximately 5 feet above the ground. Both analyzers were calibrated before and after readings. Data were digitally recorded by the noise analyzer and displayed at the end of the sampling period in units of dBA. Measured quantities included L_{eq}, L_1, L_{10}, L_{50}, L_{90}, and L_{max}. A windscreen was used during all sound measurements, except for calibration. All measurement procedures conformed with the requirements of ANSI Standard S1.13-1971 (R1976).

RAIL NOISE PREDICTION METHODOLOGY

The FTA guidance manual procedure and formulas for calculating rail noise were utilized to determine noise from train operations. Using the FTA methodology, $L_{eq(1)}$ and L_{dn}, noise levels for free-field acoustic conditions (no reflections above ground) from fixed-rail sources are calculated at 50 feet, using the following equations:

For Locomotives:

$$L_{eq_L}(h) = SEL_{ref_L} + 10\log(N_{locos}) + CT - 10\log(S/50) + 10\log(V) - 35.6$$

where

$$C_T = \{ \begin{matrix} 0 \text{ for } T<6 \\ 2(T-5) \text{ for } T\geq 6 \end{matrix}$$

For Rail Cars:

$$L_{eq_c}(h) = SEL_{ref_c} + 10 \log (N_{cars}) + 20 \log (S/50) + 10 \log (V) - 35.6$$

where FTA recommends use of the following adjustments as applicable:

+5 for Jointed Track
+3 for Embedded Track on Grade
+4 for aerial Structure with Slab Track

For Warning Horns:

$$L_{eqH}(h) = SEL_{refC} - 10 \log (S/50) + 10 \log (V) - 35.6$$

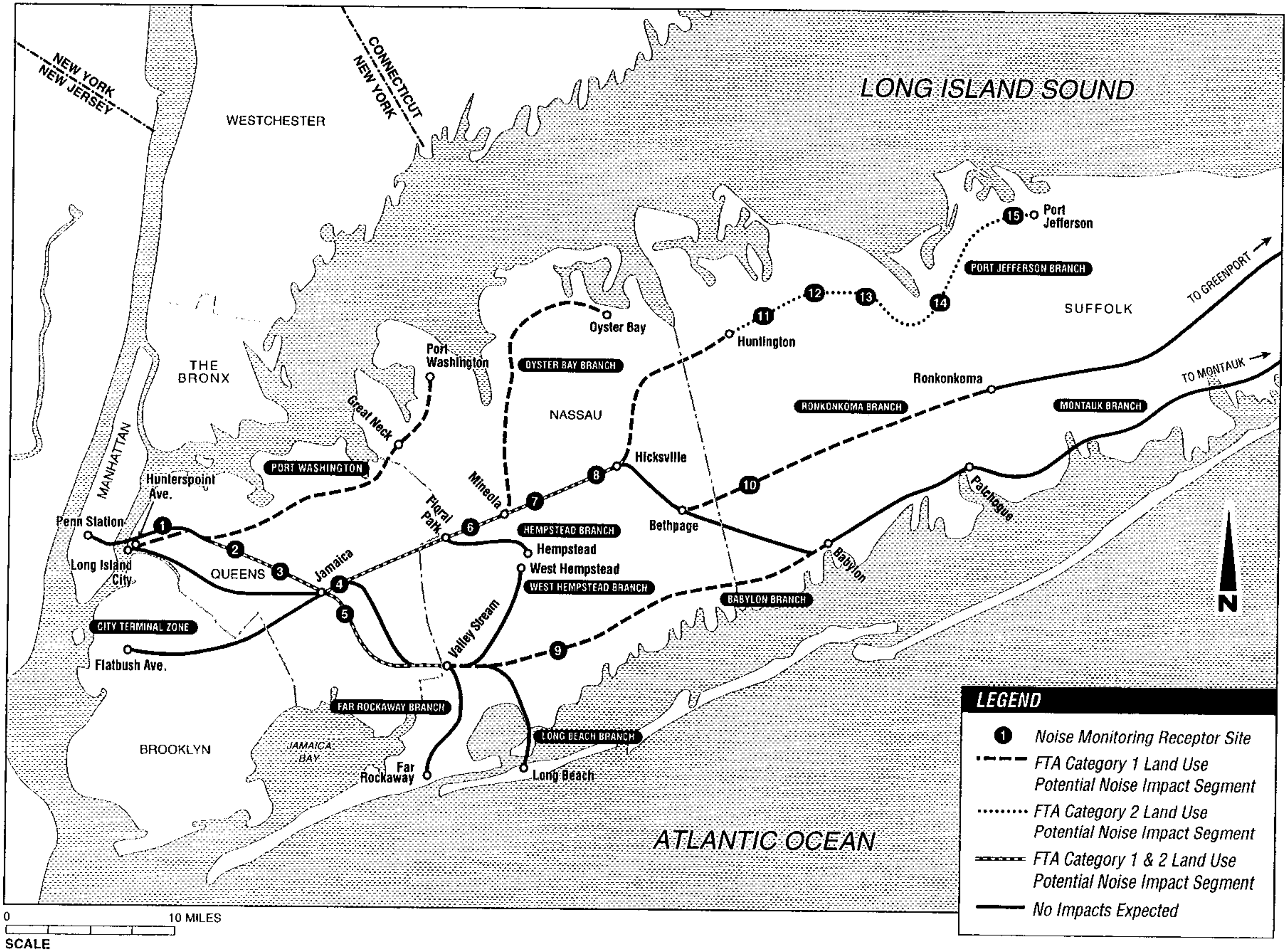


Figure 11-3

Noise Monitoring Receptor Sites

Table 11-8
Input Train Data for Detailed Noise Analysis

Segment	Site No.	Speed	Existing			No Action Alternative (2020)			Preferred Alternative (2020)		
			7 AM to 10 PM	10 PM to 7 AM	Peak Hour	7 AM to 10 PM	10 PM to 7 AM	Peak Hour	7 AM to 10 PM	10 PM to 7 AM	Peak Hour
Woodside to Jamaica$^{E/D}$	1-3	80	360/27	81/1	41/6	311/75	80/13	39/13	418/75	103/13	61/13
Jamaica to Floral Park$^{E/D}$	4	80	170/50	65/14	22/8	151/96	74/26	17/14	189/96	54/26	28/14
Jamaica to Valley Stream$^{E/D}$	5	70	222/6	78/4	29/2	223/0	78/0	27/0	284/0	89/0	42/0
Floral Park to Mineola$^{E/D}$	6	80	122/55	51/15	15/8	110/96	51/26	14/14	132/96	38/26	22/14
Mineola to Hicksville$^{E/D}$	7-8	80	122/24	53/6	15/7	110/62	50/20	14/10	132/62	38/20	22/10
Valley Stream to Babylon^{E}	9	80	NA	NA	14	NA	NA	14	NA	NA	17
Farmingdale to Ronkonkoma^{D}	10	80	NA	NA	5	NA	NA	5	NA	NA	8
Hicksville to Port Jefferson^{D}	11-15	65	26	12	3	41	18	6	41	18	6

Note: E-Electric, D-Diesel, E/D-Electric/Diesel.

NON-RAIL NOISE

While rail noise was the dominant noise source at each of the receptor sites, other sources (e.g., vehicular traffic, aircraft, children playing, neighborhood noise, etc.) contributed to total ambient noise levels. This component of the total ambient noise levels was determined by subtracting calculated existing rail noise from measured noise level. For future conditions, noise from these sources were assumed to be unchanged from existing conditions.

EXISTING CONDITIONS

Table 11-9 shows the measured (total ambient) noise levels, the calculated rail noise components of the total ambient noise levels, and the calculated non-rail components of the total ambient noise levels (additional detailed monitoring data are provided in the noise technical appendix).

The measured noise levels at residential locations ranged between 63.7 dBA L_{dn} and 86.1 dBA L_{dn}. These existing noise levels are considered "very noisy" under FTA characterizations. This high level of noise is due to the density of rail operations in the study area. Each of the 13 residential locations measured greater than 75 dBA L_{dn}—approaching the EPA-identified threshold noise level of 75 dBA L_{eq} (24-hour) to protect public health and welfare (EPA-550/9-74-004, March 1974).

The measured noise levels at park land sites ranged between 69.0 dBA L_{eq} (1-hour) and 77.0 dBA (L_{eq} 1-hour).

At all 15 receptors sites, noise from trains is the dominant noise source. Warning horn noise contributed to total noise levels at 10 of the 15 sites. At Site 8, warning horn noise was the dominant noise source.

PROBABLE IMPACTS OF THE PROJECT ALTERNATIVES

The following discussion analyzes possible noise impacts that could result from operation of the project alternatives.

- Site 7 is located in the Village of Carle Place, in Nassau County. It is adjacent to the Mineola to Hicksville segment, in a high-rise residential area with 10-story apartment buildings. The rail tracks at this location are at-grade. The nearest residences are located approximately 60 feet from the tracks. The receptor was approximately 30 feet from the rail track, in the rear parking area of a high-rise apartment building.
- Site 8 is located at Kinkel Street and Railroad Avenue in the Village of New Cassel, in Nassau County. It is adjacent to the Floral Park to Mineola segment, in a low-rise residential area with 2-story private houses. The rail tracks at this location are at-grade. The nearest residences are located approximately 70 feet from the tracks. At this location train horn noise is a significant contributing factor to total ambient noise levels. In addition, traffic from Urban Avenue contributes to the total ambient noise levels.
- Site 9 is located at the border of Freeport and Merrick, in Nassau County. It is adjacent to the Valley Stream to Babylon segment, in a portion of Roosevelt Park, a Nassau County park, near 28th Street. The rail tracks at this location are at-grade.
- Site 10 is located in the Town of Babylon, in Nassau County. It is adjacent to the Farmingdale to Ronkonkoma segment, in a portion of Colonial Springs Golf Course, which represented other adjacent and nearby park areas. The rail tracks at this location are at-grade. Traffic from Long Island Avenue contributes to the total ambient noise levels.
- Site 11 is located on Rail Road Street, at a distance of 30 feet to the tracks, in the Village of Greenlawn, in Suffolk County. It is adjacent to the Hicksville to Port Jefferson segment, in a low-rise residential area with 2-story private houses. The rail tracks at this location are at-grade. The nearest residences are approximately 90 feet from the tracks. At this location train horn noise is a significant factor in terms of total ambient noise levels. In addition, traffic from Cuba Road contributes to the total ambient noise levels.
- Site 12 is located on Bark Street in the Village of East Northport, in Suffolk County. It is adjacent to the Hicksville to Port Jefferson segment, in a low-rise residential area with 2-story private houses. The rail tracks at this location are at-grade. The nearest residences are approximately 60 feet from the tracks. The noise receptor, approximately 115 feet from the tracks, was shielded from the tracks by one row of houses.
- Site 13 is located on Nob Hill Drive in the Town of Smithtown, in Suffolk County. It is adjacent to the Hicksville to Port Jefferson segment, in a low-rise residential area with 2-story private houses. The rail tracks at this location are at-grade. The nearest residences are approximately 100 feet from the tracks.
- Site 14 is located just off North Country Road in the Village of St. James, in Suffolk County. It is adjacent to the Hicksville to Port Jefferson segment, at a location adjacent to a health-care center and 2-story apartment buildings. The rail tracks at this location are at-grade. The receptor was approximately 70 feet from the tracks, and the nearest residences are approximately 80 feet from the tracks.
- Site 15 is located at the end of Baylis Street in the Village of Port Jefferson Station, in Suffolk County. It is adjacent to the Hicksville to Port Jefferson segment, in a low-rise residential area with 2-story private houses. The rail tracks at this location are at-grade. The nearest residences are approximately 35 feet from the tracks.

Table 11-10

Impact Evaluation of Noise from the No Action Alternative

Noise Receptor Site	Land Use Category	Noise Descriptor	Existing Noise Level*	No Action Noise Level
1	2	L_{dn}	68.0	69.7
2	2	L_{dn}	71.3	73.0
3	2	L_{dn}	72.2	74.1
3	1	L_{eq}	77.6	78.6
4	2	L_{dn}	77.2	78.9
5	2	L_{dn}	76.3	77.1
6	2	L_{dn}	77.2	78.9
7	2	L_{dn}	76.3	78.3
8	2	L_{dn}	75.6	78.7
9	1	L_{eq}	69.0	69.3
10	1	L_{eq}	77.3	77.4
11	2	L_{dn}	79.2	80.8
12	2	L_{dn}	67.9	70.4
13	2	L_{dn}	67.3	70.0
14	2	L_{dn}	67.3	70.4
15	2	L_{dn}	77.6	80.5

Notes:
*Adjusted to values at nearest residence.
For definition of land use categories, see Table 11-2.

PREFERRED ALTERNATIVE

Future noise levels for the Preferred Alternative, were calculated using the methodology previously described at locations in Queens and Long Island due to increased rail operations. Table 11-11 shows the calculated project-generated increment, cumulative build noise levels, and existing noise levels. (Details are provided in the noise technical appendix.) The maximum change in L_{dn} values would be 3.1 dBA when comparing Preferred Alternative noise levels with existing noise levels, and the maximum change in $L_{eq(1)}$ values would be 1.7 dBA when comparing Preferred Alternative noise levels with existing noise levels. In general, noise levels with the Preferred Alternative would be slightly higher than noise levels with the No Action Alternative.

At the nearest residences on Barnett Avenue adjacent to Site 1, the L_{dn} noise level with the Preferred Alternative would increase by 2.1 dBA compared to existing levels. The project-generated L_{dn} noise level would be approximately 63.2 dBA, which would be above the FTA impact criteria value of 62.9 dBA. Therefore, at Site 1, noise due to the Preferred Alternative would have an impact based on FTA noise impact criteria.

At the nearest residences on 63rd Avenue adjacent to Site 2, the L_{dn} noise level with the Preferred Alternative would increase approximately 2.2 dBA compared to existing levels. The project-generated L_{dn} noise level would produce L_{dn} noise levels of approximately 69.5 dBA,

Combined:

$$L_{eq}\,(h) = 10 \log [10^{(LeqL/10)} + 10^{(LeqC/10)} + 10^{(LeqH/10)}]$$

$$L_{dn} = 10 \log [(15) \times 10^{(Leq(day)/10)} + (9) \times 10^{(Leq(night) + 10/10)}]$$

where:

N_{locos} = average number of locomotives per train
N_{cars} = average number of cars per train
T = average throttle setting of diesel-electric locomotive
S = train speed, in miles per hour
V = average hourly volume of train traffic, in trains per hour
V_d = average hourly daytime volume of traffic, in trains per hour
= number of trains, 7 AM to 10 PM / 15
V_n = average hourly nighttime volume of traffic, in trains per hour
= number of trains, 10 PM to 7 AM / 9
SEL_{ref} = 92 dBA for locomotive
82 for rail cars
108 for locomotive horn[*]

Noise levels calculated at 50 feet from the equations above were corrected for distance as follows:

$$(L_{dn} \text{ or } L_{eq(1)})\Big|_{\text{at D feet}} = (L_{dn} \text{ or } L_{eq(1)})\Big|_{\text{at 50 feet}} - 10 * \log\left(\frac{D}{50}\right) - 10G\log\left(\frac{D}{42}\right) - A_{shielding}$$

where

D = the distance from the source to the receptor in feet

G = the ground factor; for hard ground G = 0
for soft ground $G = 0.66 \quad H_{eff} < 5$
$= 0.75\ (1 - \frac{H_{eff}}{42}) \quad 5 < H_{eff} < 42$
$= 0 \quad H_{eff} > 42$

Heff = sum of average path heights on either side of barrier

$A_{shielding}$ = sound attenuation shielding between source and receiver (see section 6.3.2, FTA)

Table 11-8 shows passbys[**] and speed data used for detailed noise assessment calculations.

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[*] The analysis assumes an SEL_{ref} value of 108 for locomotive warning horn noise for Existing, No Action, and Build alternatives. LIRR has recently started a program to retrofit locomotives with a warning horn that will result in a significantly less-intrusive horn sound that will comply with the minimum 96 dB standard required by the Federal Railroad Administration.

[**] Train passbys at a given location consist of both trains with passengers and those not in service but headed to a yard or terminal station.

At the nearest residences on Smith Street adjacent to Site 5, the L_{dn} noise level with the Preferred Alternative would increase 0.9 dBA compared to existing levels. The project-generated L_{dn} noise level would be approximately 70.0 dBA, which would be above the FTA impact criteria value of 65.0 dBA. Therefore, at Site 5, noise with the Preferred Alternative would have an impact based on FTA noise impact criteria.

At the nearest residences on Main Street adjacent to Site 6, the L_{dn} noise level with the Preferred Alternative would increase 1.1 dBA compared to existing levels. The project-generated L_{dn} noise level would be approximately 71.6 dBA, which would be above the FTA impact criteria value of 65 dBA. Therefore, at Site 6, noise with the Preferred Alternative would have an impact based on FTA noise impact criteria.

At the nearest residences on Post Avenue adjacent to Site 7, existing noise levels are relatively high, and the L_{dn} noise level with the Preferred Alternative would increase 0.4 dBA compared to existing levels. The project-generated L_{dn} noise level with the Preferred Alternative would be approximately 65.8 dBA, which would be above the FTA impact criteria value of 65.0 dBA. Therefore, at Site 7, noise due to the Preferred Alternative would have an impact based on FTA noise impact criteria.

At the nearest residences on Kinkel Street adjacent to Site 8, where existing ambient noise levels are affected by noise from train warning horns as trains approach the Urban Avenue and Railroad Avenue at-grade crossing, the L_{dn} noise level with the Preferred Alternative would increase 1.4 dBA compared to existing levels. The project-generated L_{dn} noise level would be approximately 71.5 dBA, which would be above the FTA impact criteria value of 65.0 dBA. Therefore, at Site 8, noise with the Preferred Alternative would have an impact based on FTA noise impact criteria. In addition, even without the train warning horn, the L_{dn} noise levels would result in noise impacts per FTA impact criteria. The predicted impacts with the Preferred Alternative would extend approximately 2 blocks adjacent to the track right-of-way to Railroad Avenue, where traffic noise on Railroad Avenue would be expected to mask the train noise. Peak passby noise from horn blowing would extend a slightly longer distance and would also be masked by noise from traffic on Railroad Avenue.

At Roosevelt Park adjacent to Site 9, the L_{eq} noise level with the Preferred Alternative would increase 1.1 dBA compared to existing levels. The project-generated L_{eq} noise level would be approximately 63.5 dBA, which would be below the FTA impact criteria value of 63.6 dBA. Therefore, at Site 9, noise with the Preferred Alternative would not have an impact based on FTA noise impact criteria.

At Colonial Springs Golf Course near 28th Street adjacent to Site 10, a Category 1 land use site, the L_{eq} noise level with the Preferred Alternative would increase 0.9 dBA compared to existing levels. The project-generated L_{eq} noise level would be approximately 70.7 dBA, which would be above the FTA impact criteria value of 65.0 dBA. Therefore, at Site 10, noise with the Preferred Alternative would have an impact based on FTA noise impact criteria.

At the nearest residences on Railroad Avenue adjacent to Site 11, where existing ambient noise levels are relatively high and are affected by noise from train warning horns as the trains approach the Cuba Avenue and Railroad Avenue at-grade crossing, the L_{dn} noise level with the Preferred Alternative would increase 1.6 dBA compared to existing levels. The project-generated L_{dn} noise level would be approximately 75.9 dBA, which would be above the FTA severe impact criteria value of 75.0 dBA. At Site 11, noise with the Preferred Alternative would

Table 11-9
Existing Noise Levels

LIRR Receiver	Noise Descriptor	Measured Total Noise Level	Calculated Rail Noise Level	Calculated Non-Rail Noise Level
1	L_{dn}	69.6	67.7	65.2
2	L_{dn}	71.0	69.3	66.2
3	L_{dn}	74.7	73.6	68.6
3	L_{eq}	77.6	74.0	75.2
4	L_{dn}	76.7	75.9	69.0
5	L_{dn}	75.8	74.4	70.2
6	L_{dn}	77.2	76.9	65.0
7	L_{dn}	80.8	80.6	68.3
8*	L_{dn}	75.6	74.9	67.1
9	L_{eq}	69.0	69.0	44.5
10*	L_{eq}	77.3	73.5	75.0
11	L_{dn}	86.1	84.8	80.0
12	L_{dn}	63.7	61.7	59.3
13	L_{dn}	70.5	69.0	65.3
14	L_{dn}	68.2	67.5	60.0
15	L_{dn}	79.0	77.9	72.4

Note: * Includes noise from train warning horns

NO ACTION ALTERNATIVE

Future noise levels for the No Action Alternative, were calculated using the methodology previously described. Table 11-10 shows the calculated No Action Alternative noise levels and existing noise levels. (Details are provided in the noise technical appendix.) As shown in Table 11-10, the maximum change in L_{dn} values would be 3.1 dBA when comparing No Action noise levels with existing noise levels, and the maximum change in $L_{eq(1)}$ values would be 1.0 dBA when comparing No Action noise levels with existing noise levels. These changes are due to changes in service predicted to occur without the proposed project (e.g., changes in the number of trains, electric and diesel consists, etc.). These changes would result in impacts at most receptor sites, and severe impacts at two receptor sites, when FTA impact criteria were applied to this alternative. As previously discussed, a severe impact denotes an increase in noise level that is perceived by most people as annoying while an impact is noticeable but not sufficient to result in adverse community reaction.

The noise results presented above, while calculated at specific receptor sites, reflect effects of the No Action Alternative at comparable locations along the specified rail segment. Similar increases in noise level may occur one or two blocks further away from the track (depending on the shielding provided by buildings, and vehicular noise levels from traffic on the adjacent street). The additional trains with the No Action Alternative (compared to existing conditions) would increase the number of trains passbys at all 15 of the receptor sites and consequently increase the number (but not the magnitude) of intrusive passby events.

at residences (i.e., it states that no person shall operate or permit to be operated a circulation device which creates a sound level in excess of 45 dBA inside a dwelling unit measured at a point 3 feet from the open portion of the nearest window). Operation of mechanical equipment would not produce impacts per FTA criteria; however, testing of some of the proposed mechanical equipment may produce short-term noise levels which are intrusive and annoying.

Airborne noise from train operations below grade (i.e., subway) would not be expected to produce noise impacts. The primary concerns from train operations below grade are typically noise emanating through openings to the street through ventilation shafts and subway station entrances. Because of equipment specifications and design, for the Preferred Alternative, noise from ventilation equipment and shafts would not produce noise levels that cause project impacts. In addition, with the Preferred Alternative, there would be no subway stations, and therefore, no locations where noise from below grade rail vehicle operations would produce significantly increased noise levels above grade. Consequently, noise from these sources would not result in project impacts.

Noise levels due to additional vehicular traffic generated by the Preferred Alternative would not increase perceptibly either in the GCT area, or in the area adjacent to the various LIRR stations where the additional service would be provided. In the GCT area, the Preferred Alternative would generate approximately 300 new taxi trips in the peak hours, and lesser numbers of trips during off-peak hours. These additional trips would not result in a significant increase in traffic volumes on the surrounding streets and, per FTA criteria, would not cause a significant noise impact. Similarly, the additional trips generated by the Preferred Alternative at LIRR stations—where additional service would be provided as part of this project—would not result in significant increases in traffic volumes on the surrounding streets and, per FTA criteria, would not cause any significant noise impacts.

TSM ALTERNATIVE

The TSM Alternative would increase LIRR train length, and would increase service to the LIRR Hunterspoint Avenue and Long Island City stations.

In general, increasing the train length would result in noise levels that would be slightly (but not appreciably) higher that those shown in Table 11-10 for the No Action Alternative. The maximum change in L_{dn} values would be approximately 3.2 dBA when comparing TSM Alternative noise levels with existing noise levels, and the maximum change in $L_{eq(1)}$ values would be 1.1 dBA when comparing TSM Alternative noise levels with existing noise levels. Based on FTA impact criteria, these changes would result in impacts at most receptor sites, and severe impacts at a few receptor sites. The additional trains with the TSM Alternative (compared to existing conditions) would increase the number of trains passbys at all 15 of the receptor sites and consequently increase the number (but not perceptibly change the magnitude) of intrusive passby events.

In general, the increase in service between the LIRR Hunterspoint Avenue and Long Island City stations would result in an increase in noise levels at any sensitive receptor sites adjacent to this portion of track. There are few sensitive receptors immediately adjacent to this portion of track (i.e., the predominant land use is industrial). However, because existing noise levels in this area are high, it is likely that the increase in the number of trains with the TSM Alternative would result in impacts, and possibly severe impacts, at any sensitive receptor sites adjacent to the track on this segment of the rail line. In addition, the additional trains with the TSM Alternative (compared to existing conditions) would increase the number of train passbys at locations

Table 11-11
Impact Evaluation of Noise from the Preferred Alternative

Noise Receptor Site	Land Use Category	Noise Description	Existing Noise Level*	Allowable Project-Generated Noise Level		Predicted Project-Generated Increment Noise Level	Result	Build Noise Level
				Impact	Severe Impact			
1	2	L_{dn}	68.0	62.9	68.1	63.2	Impact	70.1
2	2	L_{dn}	71.3	65.0	70.4	69.5	Impact	73.5
3	2	L_{dn}	72.2	65.0	71.1	70.9	Impact	74.7
3	1	L_{eq}	77.6	70.6	75.3	74.2	Impact	79.3
4	2	L_{dn}	77.2	65.0	75.0	71.1	Impact	78.2
5	2	L_{dn}	76.3	65.0	74.2	70.0	Impact	77.2
6	2	L_{dn}	77.2	65.0	75.0	71.6	Impact	78.3
7	2	L_{dn}	76.3	65.0	74.2	65.8	Impact	76.7
8	2	L_{dn}	75.6	65.0	73.7	71.5	Impact	77.0
9	1	L_{eq}	69.0	63.6	68.8	63.5	No Impact	70.1
10	1	L_{eq}	77.3	65.0	75.0	70.7	Impact	78.2
11	2	L_{dn}	79.2	65.0	75.0	75.9	Severe Impact	80.8
12	2	L_{dn}	67.9	63.8	68.9	66.8	Impact	70.4
13	2	L_{dn}	67.3	62.4	67.7	66.7	Impact	70.0
14	2	L_{dn}	67.3	62.5	67.7	67.5	Impact	70.4
15	2	L_{dn}	77.6	65.0	75.0	77.4	Severe Impact	80.5

Notes:
*Adjusted to values at nearest receptor
For definition of land use categories, see Table 11-2.

which would be above the FTA impact criteria value of 65.0 dBA. Therefore, at Site 2 noise with the Preferred Alternative would have an impact based on FTA noise impact criteria.

At the nearest residences on Burns Street adjacent to Site 3, the Ldn noise level with the Preferred Alternative would increase approximately 2.5 dBA compared to existing levels. The project-generated Ldn noise level would produce Ldn noise levels of approximately 70.9 dBA, which would be above the FTA impact criteria value of 65.0 dBA. At Site 3, noise with the Preferred Alternative would have an impact based on FTA noise impact criteria. In addition, the peak hour Leq noise level (Category 1 land use) with the Preferred Alternative would increase approximately 1.7 dBA compared to existing levels. The project-generated L_{eq} noise level would produce L_{eq} noise levels of approximately 74.2 dBA, which would be above the FTA impact criteria value of 65.0 dBA. Therefore, at Site 3 noise with the Preferred Alternative would have an impact based on FTA noise impact criteria for Category 1 and Category 2 land uses.

At the nearest residences on 175th Street adjacent to Site 4, the L_{dn} noise level with the Preferred Alternative would increase 1.0 dBA compared to existing levels. The project-generated L_{dn} noise level would be approximately 71.1 dBA, which would be above the FTA impact criteria value of 65.0 dBA. Therefore, at Site 4, noise with the Preferred Alternative would have an impact based on FTA noise impact criteria.

Preferred Alternative. Consequently, the LIRR is not proposing to provide noise mitigation as part of the project, and predicted impacts and/or severe impacts would be unmitigated.

C. VIBRATION

INTRODUCTION AND METHODOLOGY

Fixed railway operations have the potential to produce high vibration levels, since railway vehicles contact a rigid steel rail with steel wheels. The effects of ground-borne vibration include discernable movement of building floors, rattling of windows, shaking of items on shelves or hanging on walls, and rumbling sounds. Train wheels rolling on the steel rails create vibration energy that is transmitted into the track support system. The amount of vibrational energy is strongly dependant on factors such as how smooth the wheels and rails are, and the vehicle suspension system. The vibration of the track structure "excites" the adjacent ground, creating vibration waves that propagate through the various soil and rock strata to the foundations of nearby buildings. As the vibration propagates from the foundation through the remaining building structure, certain resonant, or natural, frequencies of various components of the building may be excited.

The vibration of floors and walls may cause perceptible vibration, rattling of items such as windows or dishes on shelves, or a rumble noise. The rumble is the noise radiated from the motion of the room surfaces. This is called ground-borne noise.

The project's potential effects on vibration resulting from the operation of the new service to Grand Central Terminal (GCT) are analyzed in this section, after a brief introduction to vibration fundamentals and impact criteria.

VIBRATION FUNDAMENTALS

Vibrations consist of rapidly fluctuating motions in which there is no "net" movement. When an object vibrates, any point on the object is displaced from its initial "static" position equally in both directions so that the average of all its motion is zero. Any object can vibrate differently in three mutually independent directions; vertical, horizontal, and lateral. It is common to describe vibration levels in terms of velocity, which represents the instantaneous speed at a point on the object that is displaced. In a sense, the human body responds to an average vibration amplitude, which is usually expressed in terms of the root mean square (rms) amplitude.

Measurement of Vibration Levels

The root mean square of a vibration signal is the average of the squared amplitude of the signal over a given time period (usually 1 second). The rms velocity is normally described in inches per second in the U.S. Decibel notation is in common use for vibration level, defined as:

$$L_v = 20 \log (V/V_{ref})$$

where L_v is the velocity level in decibels, V is the rms velocity amplitude, and V_{ref} is the reference velocity amplitude. All vibration levels in this document are referenced to 1×10^{-6} inches per second. "VdB" (referenced to 1×10^{-6} inches per second) is used for vibration decibels to reduce the potential for confusion with noise decibels.

have a severe impact based on FTA noise impact criteria. In addition, even without the train warning horn, the L_{dn} noise level would result in severe noise impacts per FTA criteria.

At the nearest residences on Bark Street adjacent to Site 12, where existing ambient noise levels are relatively low, the L_{dn} noise level with the Preferred Alternative would increase 2.5 dBA compared to existing levels. The project-generated L_{dn} noise level would be approximately 66.8 dBA, which would be above the FTA impact criteria value of 63.8 dBA. Therefore, at Site 12, noise with the Preferred Alternative would have an impact based on FTA noise impact criteria.

At the nearest residences on Bark Street adjacent to Site 13, the L_{dn} noise level with the Preferred Alternative would increase 2.7 dBA compared to existing levels. The project-generated L_{dn} noise level would be approximately 66.7 dBA, which would be above the FTA impact criteria value of 62.4 dBA. Therefore, at Site 13, noise with the Preferred Alternative would have an impact based on FTA noise impact criteria.

At the nearest residences on Northern County Avenue adjacent to Site 14, the L_{dn} noise level with the Preferred Alternative would increase 3.1 dBA compared to existing levels. The project-generated L_{dn} noise level would be approximately 67.5 dBA, which would be above the FTA severe impact criteria value of 62.5 dBA. Therefore, at Site 14, noise with the Preferred Alternative would have a severe impact based on FTA noise impact criteria.

At the nearest residences on Baylis Avenue adjacent to Site 15, the L_{dn} noise level with the Preferred Alternative would increase 2.9 dBA compared to existing levels. The project-generated L_{dn} noise level would be approximately 77.4 dBA, which would be above the FTA severe impact criteria value of 75.0 dBA. Therefore, at Site 15, noise with the Preferred Alternative would have a severe impact based on FTA noise impact criteria.

The noise results presented above, while calculated at specific receptor sites, reflect effects of the Preferred Alternative at comparable locations along the specified rail segment. At locations where impacts or severe impacts are predicted to occur, these impacts would also occur at comparable locations along the specified rail segment, and may also occur one or two blocks further away from the track (depending on the shielding provided by buildings, and vehicular noise levels from traffic on the adjacent street). The additional trains due to the Preferred Alternative (compared to existing conditions) would increase the number of trains passbys at all 15 of the receptor sites and consequently increase the number (but not the magnitude) of intrusive passby events.

Stationary source mechanical equipment (i.e., ventilation facilities, power substations, etc.) would be designed so that noise produced by operation of this equipment would not result in noise impacts. The Preferred Alternative would require the addition of new ventilation facilities beneath either 54th Street (Option 1) or 55th Street (Option 2), as well as the expansion of existing above-grade facilities in other locations in Manhattan, Roosevelt Island, and Queens. In addition, the Preferred Alternative would require a new ventilation building at 47 East 44th Street. Under Option 1, this new building would be used for emergency ventilation only. Under Option 2, this new building would house emergency ventilation equipment and also house gas-fired chiller equipment on its roof to provide heating, ventilation, and air conditioning for the new mezzanine area in the lower level of GCT. The equipment for all of the proposed facilities is being designed to meet all applicable noise standards and regulations, and to avoid producing noise levels that cause impacts. Equipment in New York City would meet the provisions of Local Law No. 64, which provides noise criteria based upon zoning designations, and Section 24-237 of the New York City Noise Code, which limits noise produced by circulation devices represents a good foundation for predicting annoyance from ground-borne noise and vibration in residential areas.

The FTA-developed criteria for environmental impact from ground-borne vibration and noise are based on the maximum levels for a single events. The impact criteria are defined in the FTA guidance manual. The criteria for acceptable ground-borne vibration are expressed in terms of rms velocity levels in decibels and the criteria for acceptable ground-borne noise are expressed in terms of A-weighted sound level. The limits are specified for the three land use categories defined below:

- **Vibration Category 1: High Sensitivity**—Buildings where low ambient vibration is essential for the operations within the building, which may be well below levels associated with human annoyance. Typical land uses are vibration-sensitive research and manufacturing, hospitals, and university research operations.
- **Vibration Category 2: Residential**—This category covers all residential land uses and any buildings where people sleep, such as hotels and hospitals. No differentiation is made between different types of residential areas. This is primarily because ground-borne vibration and noise are experienced indoors and building occupants have practically no means to reduce their exposure. Even in a noisy urban area, the bedrooms often will be quiet in buildings that have effective noise insulation and tightly closed windows. Hence, an occupant of a bedroom in a noisy urban area is likely to be just as sensitive to ground-borne noise and vibration as someone in a quiet suburban area.
- **Vibration Category 3: Institutional**—This category includes schools, churches, other institutions, and quiet offices that do not have vibration-sensitive equipment, but still have the potential for activity interference.

There are some buildings, such as concert halls, TV and recording studios, and theaters, that can be very sensitive to vibration and ground-borne noise, but do not fit into any of these three categories. Special vibration level thresholds are defined for these land uses. Based on preliminary field surveys, this type of land use has not been identified near enough to the project alignment to consider in this assessment. Therefore, for simplicity, this assessment considers only the three vibration categories listed above. Table 11-13 includes ground-borne vibration and noise impact criteria for the three land use categories defined above. For this analysis, the criteria for frequent events was used for impact assessment and mitigation analysis.

IMPACT ASSESSMENT METHODOLOGY

FTA has provided guidance about the assessment and analysis of vibration impacts caused by new rail systems. FTA provides two approaches to vibration assessment: (1) General Vibration Assessment; and (2) Detailed Vibration Analysis. The General Assessment uses generalized data to develop a curve of vibration levels as a function of distance from the track, and is useful to screen alternatives when detailed data is not available to assess impacts. FTA recommends the Detailed Vibration Analysis during final design or at the outset of the project if there are particularly sensitive land uses in close proximity to the track.

The detailed approach incorporates an on-site impact testing method to determine the "transfer mobility." Transfer mobility is a measure of the efficiency of vibration transmission through the ground and offers a way to predict train and construction-induced vibration levels in buildings with reasonable accuracy before a project is constructed.

adjacent to this segment of the rail line and consequently increase the number of intrusive passby events.

MITIGATION

Mitigation measures were explored to eliminate and/or reduce impacts and severe impacts predicted to occur with the Preferred Alternative. The measures examined generally fall into three categories: treatments that reduce noise levels at the source; measures that reduce noise levels along the source-to-receiver propagation path; and treatments that reduce noise levels at the receiver.

Source treatments include: vehicle noise specifications whereby new and reconditioned trains, cars, and other equipment must meet stringent noise requirements; rail/wheel treatments, such as wheel truing, rail grinding, etc.; and operational restrictions such as reducing speeds and reducing operations. The LIRR already has a program that includes stringent vehicle noise specifications and rail/wheel treatments. Therefore, no additional benefits could be taken for implementing these measures. Operational restrictions, such as those cited above, while they would reduce noise levels, would not be acceptable in terms of satisfying service requirements of LIRR riders.

Propagation path mitigation measures include: sound barriers; noise buffers; and alternative alignments. Sound barriers, while effective in reducing noise levels and impacts, because of the extensive length that would be required for this project, would be very costly, and would not be effective for upper floors of multi-storied buildings. Other problems with barriers include visual problems if designed improperly, graffiti, shadows, public safety concerns, and the potential to divide communities. The LIRR is not proposing to provide sound barriers as mitigation for this project. It would not be feasible to provide noise buffers or to change the alignment to mitigate impacts.

Receiver treatments include: providing sound insulation for buildings; and alternative ventilation. Sound insulation typically includes providing new windows, tight fitting doors, and caulking and insulating the building. Alternative ventilation includes providing either air conditioning or some type of air handling system which allows occupants to keep their windows shut, even in warm weather, thereby reducing interior noise levels. This type of mitigation would carry very high costs due to the large number of private residences and other buildings that would require this type of treatment. Consequently, the LIRR is not proposing to provide receiver treatment as mitigation for this project.

An additional type of mitigation that falls within the source treatment category which should be mentioned, is a set of measures which would reduce train warning horn noise. Train warning horns typically produce maximum passby noise levels, L_{max}, of between 90 to 105 dBA at 50 feet, and are intrusive. While there are some measures which utilize warning devices placed on the street (rather than on the moving train) that are directional and tend to limit the area impacted by warning horn noise, these measures often present operational problems, and would reduce, but not eliminate project impacts at locations where train horn noise is present. Absent the elimination of the at-grade crossing and the construction of noise barriers, there is no effective mitigation to eliminate impacts at Receptor Sites 8 and 11, where train horn noise is a significant noise source.

In conclusion, there are no measures that would not be highly expensive and/or present other problems, to mitigate impacts and/or severe impacts that are predicted to occur as a result of the

Table 11-14
Ambient Vibration Levels

Site No.	Address	Vibration Level (VdB)
1	466 Lexington Avenue	56-72[1]
2	270 Park Avenue	55-57[1]
3	301 Park Avenue	53-77[2]
4	350 Park Avenue	31-56[1]
5	370 Park Avenue	30-59[1]
6	390 Park Avenue—Lever House	30-59[1]
7	425 Park Avenue	44-70[1]
8	500 Park Avenue	36-47[1]
9	521 Park Avenue	36-66[2]
10	786 Lexington Avenue	37-78[3]
11	166 East 63rd Street	32-51[1]
12	201 East 62nd Street	33-49[1]
13	250 East 63rd Street	33-49[1]
14	Newcomer High School	28-55[2, 4]

Notes:
[1] Monitoring performed during May 1999.
[2] Monitoring performed during July 1999.
[3] Monitoring performed during September 1999.
[4] Newcomer High School (not shown in Figure 11-4) is located in Queens near Northern Boulevard.

Currently, only four sites experience maximum vibration levels on the order of 72 VdB, and most sites experience much lower vibration levels. The lowest vibration levels are on the order of 30 VdB. Graphs of the 24-hour vibration data for each measurement site are presented in the vibration appendix. The peaks in vibration level are due to nearby trains, surface vehicular traffic, and mechanical equipment in the building.

TRAIN FORCE DENSITY AND TRANSFER MOBILITY

The Detailed Vibration Analysis procedure requires train force density to predict vibration levels at a particular location. Force density is the actual force applied to the ground by the train. This force cannot be measured directly, but it can be inferred by measuring train-induced vibration and transfer mobility. The point source transfer mobility is determined by using an instrumented drop weight and a series of vibration sensors at various distances from the impact. The line source transfer mobility is the sum of point source mobilities evaluated along a line representing the train.

Train force density tests were performed in March 1999 at a test site near Floral Park, NY, using a six-car M3 train provided by LIRR. M7 trains, which do not yet operate on the LIRR system, would also be operated in the new service to GCT along with current M3 trains. Of trains available for the test, the M3 train was the most similar to the M7 train in its operational characteristics.

Vibration data were recorded from the impact hammer using accelerometers located 25, 50, 75, 100, 200, and 300 feet from the tracks. Train-induced vibration at 15, 30, 45, and 55 mph were recorded with the same accelerometer array.

Effect of Propagation Path

Vibrations are transmitted from the source to the ground, and propagate through the ground to the receiver. Soil conditions have a strong influence on the levels of ground-borne vibration. Stiff soils, such as some clay and rock, transmit vibrations over substantial distances. Sandy soils, wetlands, and groundwater tend to absorb movement and thus reduce vibration transmission. Because subsurface conditions vary widely, measurement of actual vibration conditions, or transfer mobility, at the site is the most practical way to address the variability of propagation conditions.

Human Response to Vibration Levels

Although the perceptibility threshold for ground-borne vibration is about 65 VdB, the typical threshold of human annoyance is 72 VdB. As a comparison, buses and trucks rarely create vibration that exceeds 72 VdB unless there are significant bumps in the road, and these vehicles are operating at moderate speeds. Vibration levels for typical human and structural responses and sources are shown in Table 11-12. Background vibration is usually well below the threshold of human perception, and is of concern only when the vibration affects very sensitive manufacturing or research equipment. Electron microscopes, high-resolution lithography equipment, recording studios, and laser and optical benches are typical of equipment that is highly sensitive to vibration.

Table 11-12

Typical Levels of Ground-Borne Vibration

Human/Structural Response	Velocity Level (VdB)	Typical Sources (@ 50 feet)
Threshold, minor cosmetic damage fragile buildings	100	Blasting from construction projects
		Bulldozers and other heavy tracked construction equipment
Difficulty with vibration-sensitive tasks, such as reading a video screen	90	
		Commuter rail, upper range
Residential annoyance, infrequent events	80	Rapid Transit Rail, upper range
		Commuter Rail, typical range
Residential annoyance, frequent events		Bus or Truck over bump
	70	Rapid Transit Rail, typical range
Limit for vibration-sensitive equipment. Approximate threshold for human perception of vibration		Bus or truck, typical
	60	
		Typical background vibration
	50	

Source: U.S. Dept of Transportation, FTA, *Transit Noise and Vibration Impact Assessment*, April 1995.

VIBRATION STANDARDS AND CRITERIA

With the construction of new rail rapid transit systems in the past 20 years, considerable experience has been gained about how communities would react to various levels of building vibration. This experience, combined with the available national and international standards,

Table 11-13
Ground-Borne Vibration and Noise Impact Criteria

	Ground-Borne Vibration Impact Levels			
	(VdB re 1 micro inch/sec)		(dBA re 20 micro Pascals)	
Vibration Category	Frequent Events[1]	Infrequent Events[2]	Frequent Events[1]	Infrequent Events[2]
1	65 VdB[3]	65 VdB[3]	[4]	[4]
2	72 VdB	80 VdB	35 dBA	43 dBA
3	75 VdB	83 VdB	40 dBA	48 dBA

Notes:

[1] "Frequent Events" are defined as those with more than 70 vibration events per day. Most rapid transit projects fall into this category.

[2] "Infrequent Events" are defined as those with fewer than 70 vibration events per day. This category includes most commuter rail systems.

[3] This criterion limit is based on levels that are acceptable for most moderately sensitive equipment such as optical microscopes. Vibration sensitive manufacturing or research will require detailed evaluation to define the acceptable vibration levels. Ensuring lower vibration levels in a building often requires special design of the HVAC systems and stiffened floors.

[4] Vibration-sensitive equipment is not sensitive to ground-borne noise.

Source: *Transit Noise and Vibration Impact Assessment*, FTA, April 1995, pages 8-2 through 8-3.

The detailed method consists of the following steps:

1. Characterize the existing vibration environment.
2. Determine the train's force density, which is the actual force applied to the ground by the train. Force density is frequency dependent and is also dependent on the train's speed.
3. Determine vibration transmission properties of the soil. The transfer mobility can vary dramatically depending on the underground conditions/geology. Consequently, the only practical and accurate method available to determine transfer mobility is on-site vibration propagation testing using a seismic impact hammer.
4. Determine building coupling losses. The extent to which surface vibrations are attenuated in a building depends on a variety of factors, such as the mass of the building and foundation type.
5. Calculate train-induced vibration spectra in buildings based on steps 1 through 3.

EXISTING VIBRATION ENVIRONMENT

Vibration monitoring locations were chosen above the new tunnel alignments to provide geographic coverage in the study area. A 24-hour monitoring period was used to capture both the high vibration levels that occur in the study area during the day and the lower ambient levels occurring at night. The existing vibration environment is an important factor in the assessment of a new source of vibration. If existing vibration levels are high enough, it could be that the new source of vibration would not be noticeable. Vibration from the new trains could be masked by vibration from existing train, truck, and car traffic. The monitoring locations are shown in Figure 11-4 and the range of measured maximum vibration levels is shown in Table 11-14.

Individual train vibration events (from existing train activity) were identified and train-induced vibration levels outside the building were estimated to calculate the building coupling loss. While this analysis is approximate in nature because the exact position of trains and magnitude of train vibration are unknown, it shows coupling loss values higher than those presented in the FTA manual. The details of this analysis are included in the vibration appendix.

Based on this analysis and data presented in the FTA manual, coupling loss corrections were used in the analysis, as shown in Table 11-16.

Table 11-16

Building Coupling Loss Categories

No. Stories	Coupling Loss (dB)	Source
1-2	-7	FTA
2-4	-10	FTA
>5	-12	Ambient vibration measurements

PROBABLE IMPACTS OF THE PROJECT ALTERNATIVES

NO ACTION ALTERNATIVE

Under the No Build Alternative, there would be no vibration or ground-borne impacts, since no new rail service would occur.

TSM ALTERNATIVE

The components of the TSM Alternative would not result in any increases in peak vibration levels throughout the study area since no new rail lines would be constructed.

PREFERRED ALTERNATIVE

Manhattan

The ground-borne noise and vibration effects of the Preferred Alternative were determined using the previously described methodology for both engineering options for buildings along the alignment in Manhattan. For the base case, without any special vibration mitigation, it was assumed that the track fixation method would be direct fixation (with a static stiffness of 300,000 pounds/inch). Following the discussion of the project's effect on ground-borne noise and vibration levels in the study area, is a discussion of potential mitigation measures where necessary.

Option 1. The results of the analysis for this option (LIRR station in the lower level of GCT) are presented in Figure 11-5. As shown in the figure, Option 1 of the Preferred Alternative would potentially impact ground-borne noise levels at a number of buildings along the project alignment. Vibration levels would be below the FTA criteria and no impacts would occur. In some locations, buildings farther from the tunnel show impacts while others above the alignment do not. This is due to the coupling loss of larger buildings attenuating the ground-borne noise impact better than smaller buildings further away.

Option 1 would also result in predicted ground-borne noise levels which could potentially exceed the FTA's criteria of 35 dBA for residential buildings and 40 dBA for commercial structures. The analysis indicates that 10 commercial and 123 residential structures could potentially

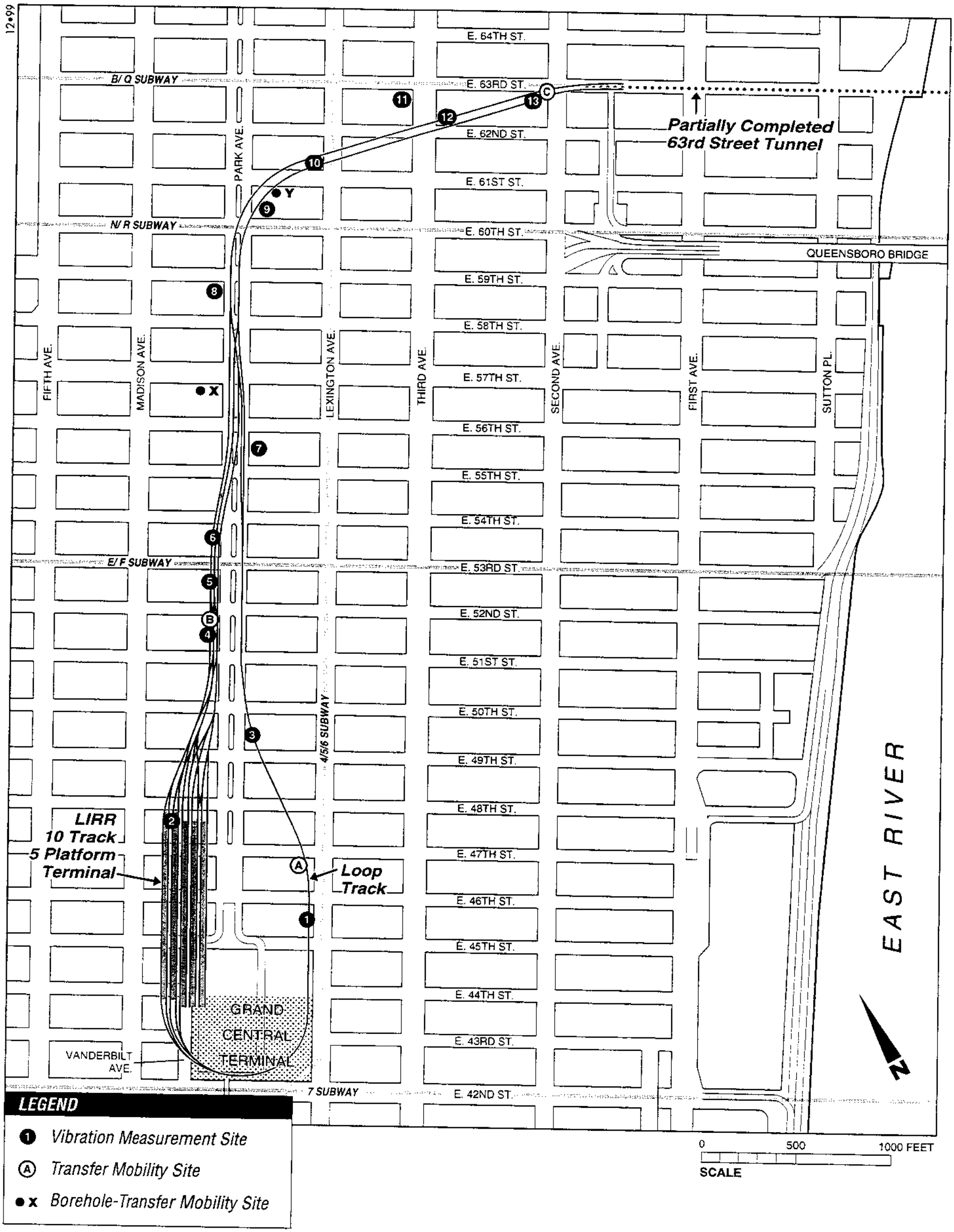

Figure 11-4

Ambient Vibration Monitoring Sites in Manhattan

Option 2

No mitigation would be necessary with this option.

QUEENS

Mitigation for the potentially impacted buildings in Queens could consist of resiliently supported ties and resilient fasteners at most locations. A few residential buildings may require more than the 10 dB insertion loss provided by the addition of resilient ties and fasteners. If necessary, mitigation could be provided by floating slab, ballast mats, or ballasted track. Similar to Manhattan, existing noise from the NYCT subway may mask this new noise source, reducing potential project impacts and the need for mitigation measures.

Additional field measurements will also be conducted in Queens to determine if the proposed project's vibration and ground-borne effects could be perceived above current conditions. ❖

As shown in Table 11-15, vibration propagation (transfer mobility) measurements were conducted at five sites within the Manhattan and Queens study areas.

Table 11-15

On-Site Vibration Propagation Test Locations

Site No.	Address	Horizontal Distance from Impact to Accelerometers (feet)
1	47th Street and Lexington Avenue	0, 18, 44, 64, 130
2	52nd Street and Park Avenue	0, 25, 50, 75, 100
3	57th Street and Park Avenue	0, 25, 52, 88, 115
4	61st Street and Park Avenue	0, 25, 50, 80, 110, 160
5	63rd Street and Second Avenue	No measurable signal
6	Queens—41st Avenue and Vernon Boulevard	0, 25, 50, 75, 100, 200

The measured data from these sites could be used to represent their respective geographic areas; however, to be conservative, the results from Site 3 were used to represent the Manhattan Study Area for depths up to 114 feet, since it yielded the most efficient vibration propagation. The geology in the Manhattan Study Area is relatively consistent and comprises rock with a thin (approximately 20-foot-thick) layer of soil on top. For depths greater than 114 feet, the results from Site 4 were used. Details on the force density and transfer mobility tests can be found in the vibration appendix.

PREDICTED TRAIN-INDUCED VIBRATION LEVELS

The force density data (as a function of train speed), vibration propagation, a track-bed correction, and building coupling corrections are used to estimate train-induced vibration levels at sensitive buildings along the corridor. The results can be expressed in terms of vibration velocity as a function of frequency. Frequency is an important parameter, since both human annoyance and specific mitigation techniques are frequency dependent.

TRACK SUPPORT CORRECTION

The track support configuration for the at-grade force density tests was tie on ballast. The basic track fixation method proposed for the project is direct fixation on the concrete tunnel invert, which is stiffer than tie on ballast. Consequently, a correction is required to account for the difference in vibration isolation between these two supports. The correction factor is a function of rail support modulus; thus, due to the differences in track fixation, vibration levels were increased approximately 4 to 7 VdB, depending on the frequency.

BUILDING COUPLING LOSS CORRECTIONS

Ground-borne vibration in buildings is typically attenuated by a certain amount, depending on how well coupled the building is to the ground. Many buildings in the Manhattan Study Area are founded on rock, FTA recommends a coupling loss of 0 dB. However, the FTA manual also cites building coupling losses ranging from 5 to 13 dB for buildings of increasing size. Since many of the buildings in the Manhattan study area are very large, it follows that the coupling losses may for buildings founded on rock in some cases be greater than 0 dB. To address this issue, the ambient building basement data were examined to estimate building coupling losses.

be impacted by this option. However, it is unlikely that these predicted levels would be higher than existing levels in areas where there is currently train activity such as along Park and Lexington Avenues. It would be expected that existing ground-borne noise from MNR and NYCT operations meet or exceed the predicted levels for the project, and there would be no impact from the project. Ground-borne noise levels may in fact be greater than existing noise in only the four buildings requiring underpinning and the residential and commercial structures in the curved portion of the alignment situated midblock between Park and Second Avenues. Therefore, the above analysis may overstate the need for mitigation to reduce ground-borne levels due to the project.

Option 2. Due to the greater track depth of this option, project-induced vibration and ground-borne noise levels would not exceed the FTA criteria at any location along the alignment.

Queens

In Queens, the alignment for both options is the same. Service for the Preferred Alternative would use the lower level of the 63rd Street Tunnel and its continuation along 41st Avenue. Throughout the entire traverse from the East River until reaching Yard A, the LIRR tracks would be below existing NYCT subway lines. Similar to Manhattan, no location would exceed the FTA's criteria for vibration impact. While the analysis of the proposed LIRR service indicates that 39 residential and 11 commercial buildings would exceed the ground-borne noise criteria (see Figure 11-6), it is unlikely that these levels would exceed current levels due to train operations in the upper tunnel.

VIBRATION MITIGATION

The most common method to reduce vibration and ground-borne noise effects of rail projects would involve the use of special track fixation methods. Resilient fasteners, resilient ties, and floating slabs can reduce vibration and ground-borne noise levels in specific frequency ranges.

MANHATTAN

Option 1

Mitigation for the Lever House, the Racquet & Tennis Club, and 400 and 410 Park Avenue would consist of a floating slab. The floating slab method utilizes two concrete slabs separated by an resilient element such that train-induced vibrations are attenuated before transfer to the entire tunnel structure. A 15 dB* insertion loss provided by the floating slab would reduce ground-borne noise to below the FTA criteria of 40 dBA. In addition, it should be noted that existing noise levels in these buildings due to both internal (e.g., mechanical and ventilation systems) and external sources may currently exceed 40 dBA. Therefore, if the option is selected, it will be necessary to determine noise levels in these buildings to determine if, in fact, this option would require a floating slab.

Mitigation for the potentially impacted residential and commercial buildings in the curve area of the alignment could consist of resilient fasteners or resiliently supported ties. A 5 dB* insertion loss provided by the resilient fasteners would reduce the number of impacted buildings to 0. Similar to the four buildings described above, it is unknown at this time the extent to which existing noise may mask this new noise source. If existing noise levels in these buildings are high, the above measures may not be necessary.

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* Based on FTA's *Transit Noise and Vibration Impact Assessment.*

Option 2

No mitigation would be necessary with this option.

QUEENS

Mitigation for the potentially impacted buildings in Queens could consist of resiliently supported ties and resilient fasteners at most locations. A few residential buildings may require more than the 10 dB insertion loss provided by the addition of resilient ties and fasteners. If necessary, mitigation could be provided by floating slab, ballast mats, or ballasted track. Similar to Manhattan, existing noise from the NYCT subway may mask this new noise source, reducing potential project impacts and the need for mitigation measures.

Additional field measurements will also be conducted in Queens to determine if the proposed project's vibration and ground-borne effects could be perceived above current conditions. ❖

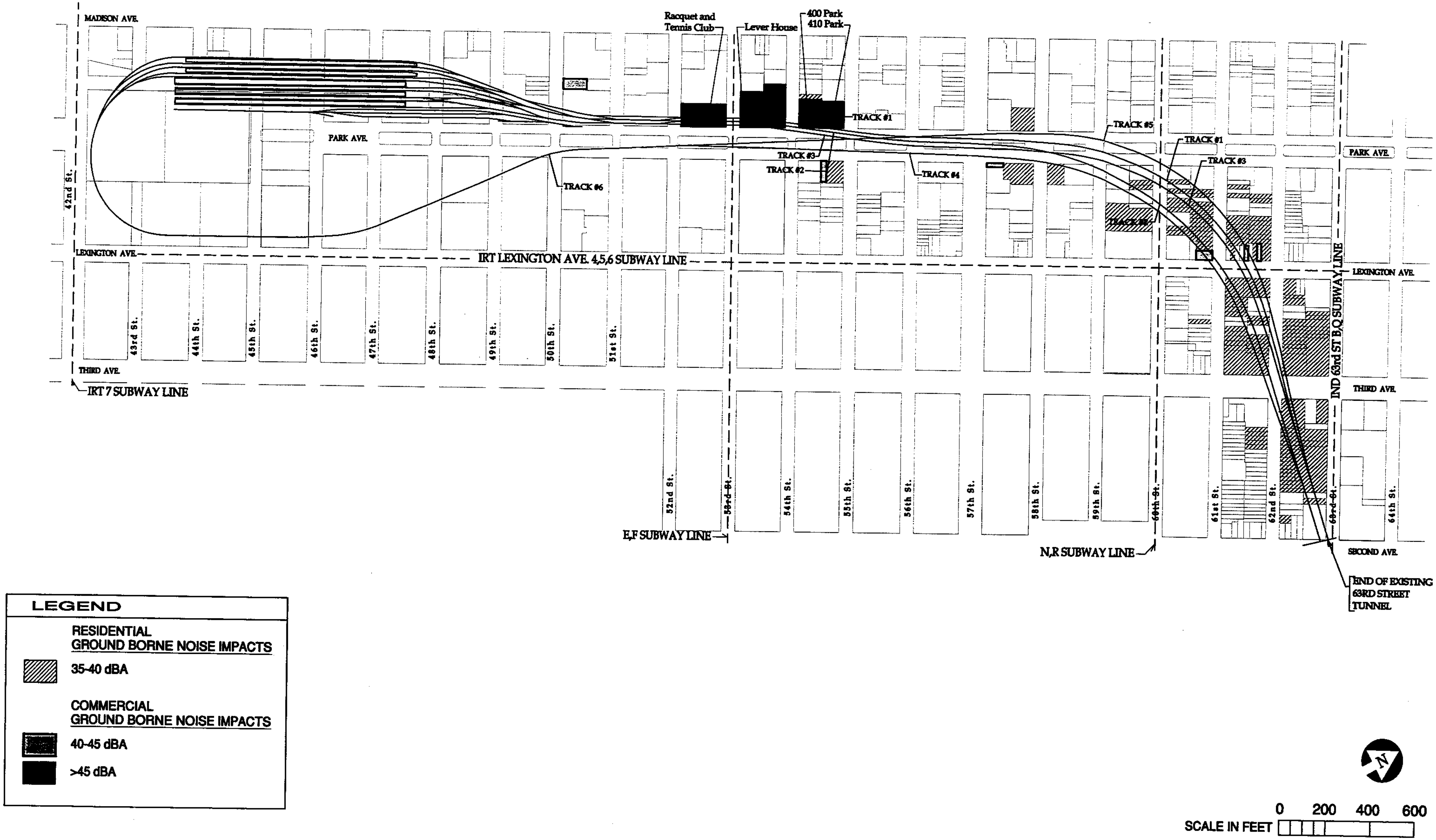

Figure 11-5

Potential Train-Induced Ground-borne Noise Impacts
Manhattan Alignment: Option 1

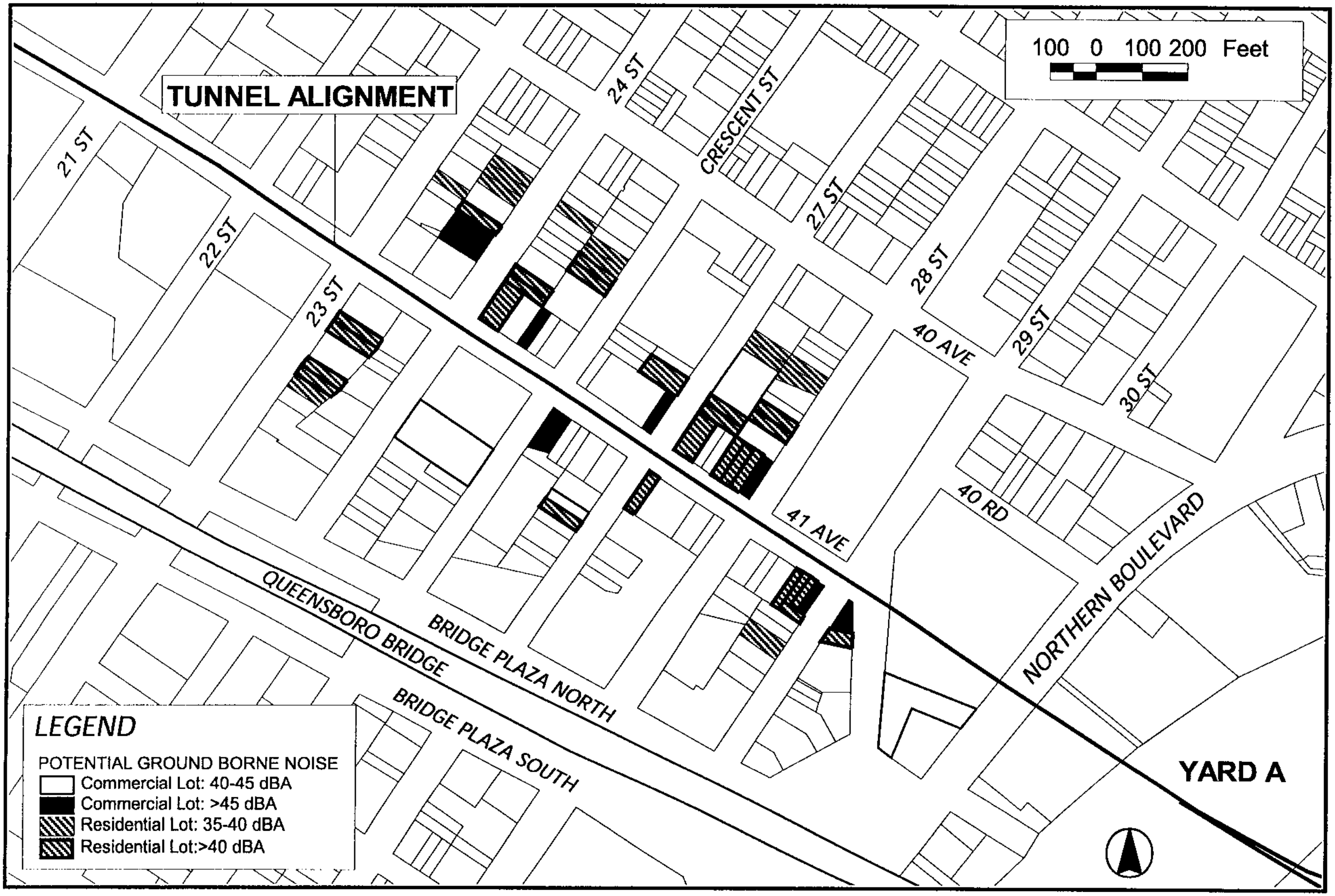

Figure 11-6
Queens Alignment: Potential Ground-Borne Noise Impacts

Chapter 12: Energy

A. INTRODUCTION

This chapter compares the direct energy expenditures associated with the TSM and Build Alternatives with that of the No Action Alternative. Direct energy expenditure is the total fuel consumption by vehicles operating on roadways in the Long Island Transportation Corridor and the energy required to operate the trains, both diesel and electric, under each scenario.

B. EXISTING CONDITIONS

Gross energy consumption in the United States in 1996 has been estimated at an equivalent of 93.81 quadrillion British Thermal Units, or BTUs.* Of that total energy consumption, the transportation sector uses 24.43 quadrillion BTUs, or approximately 26 percent (source: National Transportation Statistics, U.S. Department of Transportation). This number includes coal, natural gas, electricity, and electrical system energy losses. Electrical energy within the transportation sector is predominantly used by railroads and is a very small portion of the overall energy demand in the United States. The direct electrical energy required by railroads is generated by coal, oil, natural gas, hydroelectric, and nuclear fuel sources.

The most recent estimate available for electric power consumption by facilities operated by the Long Island Rail Road (LIRR) was approximately 426 million kilowatt hours (kwh), consumed in 1995. This is equivalent to 1.45 trillion BTUs (one kwh is equal to 3,413 BTUs). Fuel consumed by the diesel fleet totaled 6.2 million gallons, which is equivalent to 812 billion BTUs. Electric power for LIRR is provided by the New York Power Authority (NYPA). Gas and oil plants generated most of this power, and the remainder was generated by hydroelectric and nuclear sources.

C. PROBABLE IMPACTS OF THE PROJECT ALTERNATIVES

The TSM Alternative would decrease energy usage over that of the No Action Alternative. This alternative would reduce the number of automobile vehicle miles traveled (VMT) over the No Action Alternative, by attracting new riders to its improved service. However, the TSM Alternative would not increase the number of trains traveling to Manhattan in the peak period, so these new riders would experience significant crowding and inconvenience. In contrast, the Preferred Alternative would substantially increase LIRR service during the peak hour, while still decreasing the amount of energy consumed. The Preferred Alternative would increase peak hour trains from 42 (in the No Action condition) to 61, increasing energy consumption from electric train VMT. However, the Preferred Alternative would, at the same time, reduce energy consumption from automobile VMT. This would result in overall decreases in energy consumption compared with the No Action Alternative. The energy consumed by each alternative compared with the No Action Alternative is shown in Table 12-1.

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* 1 quadrillion = 1 x 10^{15}. British Thermal Units, or BTUs, are a measure of energy used to compare consumption of energy from different sources, such as gasoline, electricity, etc., taking into consideration how efficiently those sources are converted to energy. One BTU is the quantity of heat required to raise the temperature of one pound of water by one Fahrenheit degree.

Table 12-1
Net Energy Consumption for Project Alternatives vs. No Action Alternative

Alternative/ Component	Net New Annual Vehicle Miles	Total Annual Energy Consumption* (Billion BTUs)
TSM vs. No Action Alternative		
Auto	-33,650,000	-210
Electric Trains	-160,000	-16
Diesel Trains	490,000	49
Total	-33,320,000	-177
Preferred vs. No Action Alternative		
Auto	-105,510,000	-658
Electric Trains	5,324,000	532
Diesel Trains	-248,000	-25
Total	-100,434,000	-151

Note:
* BTUs per vehicle mile are based on data in FTA's *Technical Guidance on Section 5309 New Starts Criteria*, July 1999, as follows:
Auto = 6,233 BTU/vehicle miles; and
Rail = 100,000 BTU/vehicle miles.

It should be noted that the energy consumption values from the Federal Transit Administration (FTA) guidance represent the total operational energy consumption required per vehicle mile of travel. These average values are based on data from rail systems throughout the country. As an average, they include not only the energy required for traction power, but also other ancillary systems that are part of a given system. This would include the energy for communications, signals, stations, and in some cases, tunnel lighting and ventilation. While averaged nationally over a wide range of systems, these factors provide a good indicator of the relative differences in energy consumption between various modes of transportation.

Overall, no adverse energy impacts would occur under either the TSM or Preferred Alternative. Compared with the No Action Alternative, both the TSM and the Preferred Alternatives would decrease overall energy consumption.

D. MITIGATION

Neither the TSM nor the Preferred Alternative would cause significant adverse energy impacts and both would decrease the amount of non-transit-related energy consumption. Therefore, no mitigation measures are required. ⁂

A. INTRODUCTION

This chapter examines the project alternatives for their effects on utilities and other subsurface structures. The potential for the need to relocate or protect significant utilities is also assessed and described.

B. EXISTING CONDITIONS

A number of subsurface utility lines and subsurface structures, both public and private, are located beneath the streets throughout Manhattan and Queens near the project sites, including in the Sunnyside Yard/Yard A area. These include sewer and water mains, telephone cables, electric lines, gas mains, and steam lines. On average, the majority of utilities are located close to the street or yard surface. These utilities provide essential services to the properties surrounding the project sites.

C. PROBABLE IMPACTS OF THE PROJECT ALTERNATIVES

This section describes potential impacts on public utilities for each alternative. Impacts are considered significant if the relocation of the utility would result in a service disruption or if the adjacent environment would be endangered.

NO ACTION ALTERNATIVE

This alternative would not involve construction either above- or below-ground and would, therefore, have no impact on subsurface utilities in the study area.

TRANSPORTATION SYSTEMS MANAGEMENT (TSM) ALTERNATIVE

This alternative would involve some subsurface construction in Queens. Since elements of the TSM Alternative have not undergone any design, the need to relocate any utilities is unknown at this time. However, any utilities that would be impacted by subsurface excavation would either be relocated before disruption or maintained and protected during construction.

PREFERRED ALTERNATIVE

Operation of the Preferred Alternative would not generate a significant demand on the area's water supply or sewage system. Nor would it interfere with the city's ability to provide these services in the study area. The energy required to operate the project would be provided by the existing Con Edison network and would not result in a significant increase in the amount of energy consumed within the study area.

The greatest potential for project-related impacts on utilities would be during construction, when significant excavation is required at several locations in Manhattan and Queens. Due to the number of utilities typically located in New York City streets, construction of the Preferred

Alternative, similar to many other construction projects in the city, could potentially affect these buried utilities. While many of the affected utilities would be smaller lines providing street connections to buildings in the area, some major utilities may be encountered. The engineering studies to date have focused on the project's efforts on the major utilities and the measures required to ensure that service is maintained. As discussed below, further investigation and engineering design is required to determine all of the utilities that could be affected by project construction.

MANHATTAN ALIGNMENT

Northern Portion

As described in Chapter 2, "Project Alternatives," in Manhattan, the Preferred Alternative's track alignment would begin at the west end of the existing 63rd Street Tunnel, approximately 140 feet below the surface of 63rd Street and Second Avenue. From there it would traverse south and west to Park Avenue at approximately 60th Street, where it would pass beneath MNR's tunnel structure. This section of the alignment would be well below any existing utilities.

Grand Central Terminal and Approach Structures

During the construction of Grand Central Terminal (GCT) and the approach structures in the early 1900's, utilities were rebuilt or relocated along Park Avenue. Intercepting sewers were constructed within the terminal and in subsurface easements within the GCT approach tunnels, as well as in the adjacent sidewalk area along Park Avenue. Utilities that cross Park Avenue, including water, steam, gas and electric, were rerouted above the approach structure. At several locations within GCT, existing street utilities were suspended from and routed within the GCT structure.

North of 56th Street beneath Park Avenue, the alignment for Option 1 of the Preferred Alternative would be below the MNR approach structure, and there would be no interference with the utilities above or within that structure. South of 56th Street, the track alignment under Option 1 would begin to widen beneath the tracks of MNR. Between approximately 55th and 52nd Streets, the alignment would pass beneath buildings on the west side of Park Avenue, until it entered the existing GCT structure south of 52nd Street. Between 56th and 52nd Streets, the greatest potential for utility impacts would exist. Between 52nd and 54th Streets, an interceptor sewer, approximately 4 feet by 2 feet wide, is located under the west sidewalk area of Park Avenue. In addition, there are two 18-inch sewer lines at 54th Street that could be affected by the project. The alignment would also conflict with an existing siphon structure in the bed of 54th Street; however, the siphon structure appears to be filled in and abandoned. The sewers within the west sidewalk of Park Avenue between 52nd and 54th Streets, based on record drawings, appear to be at a higher elevation than the structure proposed for the Preferred Alternative. Therefore, relocation of these sewers would not be necessary if they could be maintained during the construction of the new structure.

Under Option 2, in which the alignment would be deeper than Option 1, potential utility impacts are limited to two areas: an existing 6-foot by 3-foot sewer at 46th Street, and a pipe tunnel beneath the lower track level of GCT from 48th Street to 43rd Street.

Construction of the ventilation plants and substations for the Preferred Alternative would also require new utility connections, and the existing utilities in the area of excavation would need to be protected and maintained. Construction of these facilities would affect 44th and 45th Streets from Madison Avenue to GCT (Options 1 and 2), 53rd Street west of Park Avenue (Option 1), 54th Street both east and west of Park Avenue (Option 1), Park Avenue between 51st and 52nd Streets (Option 1), and 55th Street between Madison and Park Avenues (Option 2).

One of the project's new off-street entrances, on 45th Street between Madison and Vanderbilt Avenues, would entail construction in the bed of the street. The new entrance at 347 Madison Avenue would require construction on 45th Street, and the utilities present would need to be maintained and protected. The other new entrances would be located within the easement area of buildings above the GCT trainshed, and therefore, would not affect the utilities within the streets. When utility service connections to these buildings are affected by construction, revised connections would be provided to avoid disruption of service.

QUEENS ALIGNMENT

In Queens, the Preferred Alternative's alignment would be approximately 70 feet deep when it exited the east end of the existing bellmouth of the 63rd Street Tunnel near Northern Boulevard. From this point the alignment would pass beneath Northern Boulevard, and the subway line under the street, into Yard A. At this depth, the new structure would be well below any subsurface utilities. However, the proposed cut-and-cover construction method in this area (described in Chapter 17, "Construction and Construction Impacts") would interfere with the existing utilities in the roadbed. The underpinning of the subway line beneath Northern Boulevard would require the excavation of the earth cover down to the roof of the existing structure. During this phase of the work, the existing street utilities would be protected and maintained.

As discussed previously, existing utilities are present in Sunnyside Yard and Yard A. Within these properties, construction of the project would result in probable interference with one 48-inch sewer, two 42-inch sewers, and a 12-inch water line. The new ventilation plant in Yard A would be located on top of the new train tunnel structure and would be in close proximity to the 48-inch sewer. This utility would be maintained and protected during construction. Near the Honeywell Street bridge, where the project's new tracks would rise from tunnel depth to yard level, they would cross the current location of a 42-inch sewer. A new sewer tunnel is proposed to cross under the tracks, replacing the existing sewer. The other two sewer crossings in Sunnyside Yard—another 42-inch sewer and a 48-inch sewer—would be protected and maintained in their current locations.

All of the required substations in Queens and the substation on Roosevelt Island would be located in and adjacent to existing structures and would have no long-term impact on any utilities. Any existing utilities within the construction area would be protected and maintained while new connections are made to Con Edison's existing power grid.

YARD LOCATIONS

As discussed in Chapter 15, "Natural Resources," a new separate stormwater and sanitary sewer system would be created at Highbridge Yard. Utility connections to the existing system would be required at Fresh Pond for the New York & Atlantic Railway (NYAR) maintenance facility, while Blissville or Maspeth may only require connections for power.

D. FURTHER INVESTIGATIONS AND MITIGATION

At this stage in the project design, it is not possible to determine every utility that may need to be relocated or protected due to the construction of the Preferred Alternative. However, as discussed above, several major utility conflicts have been identified as part of the project's conceptual design. While further study is required, the conceptual report identified several major utilities that would need to be relocated or maintained and protected during construction.

In Manhattan, the sewers within the west sidewalk of Park Avenue between 52nd and 54th Streets appear to be at a higher elevation than the structure proposed under the Preferred Alternative and therefore relocation of these sewers would not be necessary if they could be maintained during the construction of the new structure. Further analysis of the exact construction method to be used at this location would determine whether to relocate the sewer or incorporate it into the permanent structure.

The ventilation structures, substations, and off-street entrances may interfere with local utilities during their construction. Physical conflicts between these new facilities and existing utilities would be determined at a later date when the design of these facilities is further advanced.

Similarly, the decision to relocate the existing utilities in Northern Boulevard would be made as the design in this area proceeds.

One utility that would have to be relocated is the 42-inch sewer near the Honeywell Street bridge in Sunnyside Yard; a new 42-inch sewer would be provided, crossing under the proposed tracks. Based on the current track profiles of the Preferred Alternative, it is expected that the other two sewers (42- and 48-inch) discussed above could remain in place. However, they would require protection during construction.

To ensure that no significant adverse impacts occur to the existing utility infrastructure in the area of project construction, a utility relocation report is being prepared by the project designers. A detailed field survey is being conducted along the entire alignment of the Preferred Alternative. The purpose of this survey is to locate all visible utility street appurtenances (e.g., manholes, hydrants, etc.) and related features, and to document topographic features of the alignment. In addition, various public agencies, property owners, and private utilities are being contacted in an effort to collect and map all existing and planned utilities in the project area. As the survey maps are prepared, the utility information would be added and cross-checked with utility records. Where significant discrepancies are encountered, they would be resolved to the extent possible with field visits. Finally, the critical areas that are identified would require further investigation, which would be performed during final design. ⁂

Chapter 14: Contaminated Materials

A. INTRODUCTION AND METHODOLOGY

This chapter examines the potential for impacts related to contaminated soil and groundwater. It assesses the soil and groundwater conditions in locations potentially affected by the project (i.e., the project alignment and locations affected by the relocated Metro-North Railroad and New York & Atlantic Railway [NYAR] facilities). It then considers the potential impacts to worker safety, public health, and the environment from any potential contaminants identified, and identifies mitigation measures to be employed by the project.

For each area that would be affected by the project, the analysis begins by considering the location, type, and extent of contaminated materials that may be present in the soil or groundwater because of past or present uses either on or adjacent to the site. As described below, this assessment was conducted through a review of historic maps and regulatory records and extensive site visits and soil and groundwater sampling. The analysis then considers the project's potential to encounter any potentially contaminated soil and groundwater identified. This evaluation focuses on construction activities,* since the construction work for the project would disturb the soil and, in some locations, the groundwater. Construction activities are considered with respect to soil and groundwater conditions to assess any potential risks to public health, safety, and the environment. Finally, the chapter also describes mitigation measures to be employed to avoid potential impacts related to contaminated materials. It also describes how those measures would also avoid potential impacts associated with contaminated materials once the project is completed and operational.

LOCATIONS OF POTENTIAL CONCERN

This EIS examines three alternatives: the No Action Alternative; the Transportation Systems Management (TSM) Alternative, and the Preferred Alternative. The No Action Alternative involves no subsurface excavation and would therefore have no consequences in relation to contaminated materials. The TSM Alternative would involve considerably less subsurface work than the Preferred Alternative, and the issues would be those typically found in an older urban area. The range of contaminants and potential for impact with the TSM Alternative would be well within the "envelope" of concerns and mitigation actions associated with the Preferred Alternative. Therefore, locations of concern focus on the Preferred Alternative only, as discussed below.

The Preferred Alternative raises potential issues related to contamination in locations where soils or groundwater would be disturbed. In Manhattan, where the below-grade portions of Grand Central Terminal (GCT) are predominantly in bedrock, little soil would be encountered during construction. In locations where excavation or limited cut-and-cover work through soil would be required, an assessment of contaminated materials was conducted to determine whether the soil underlying the existing Metro-North tracks may have been contaminated by past rail activities. It is not expected that contamination would be found in sections where hard-rock tunneling techniques would be utilized, as the bedrock in Manhattan is relatively unfractured and impervious, reducing the potential for the downward migration of water or other liquids that may transport contaminants into the bedrock. However, for the same reason, there may be perched water tables at the soil/bedrock interface that could require the installation of product recovery wells if petroleum or other contaminated groundwater is encountered during construction.

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* Construction activities are described in detail in Chapter 17, "Construction and Construction Impacts."

In Queens at Yard A and Harold Interlocking, construction activities would include excavation and soft-ground tunneling techniques. Due to historic uses as rail yards, as well as the presence of numerous industrial facilities around the yards, contaminated soil and/or groundwater are likely to be found on-site. In fact, Amtrak's Sunnyside Yard has been designated by the New York State Department of Environmental Conservation (NYSDEC) as a Class II Inactive Hazardous Waste Site (significant threat to public health; environmental action is required), even though only a small fraction of the yard near Northern Boulevard and 38th Street is significantly contaminated (conditions at Sunnyside Yard are described later under "Existing Conditions"). An assessment of potential concerns related to contaminated materials at Yard A, Harold Interlocking, and Sunnyside Yard was conducted for this EIS. As described later in this chapter, special care would be taken at Sunnyside Yard, including ongoing coordination with Amtrak and NYSDEC, to ensure that the project would not interfere with any remediation efforts at the yard. In addition to using special construction techniques at Yard A, the project would construct tunnels deep beneath Sunnyside Yard to avoid affecting contaminated areas in any way.

Finally, Metro-North's Madison Yard and NYAR's operations in Yard A would be relocated to several locations (Highbridge Yard in the Bronx; and Fresh Pond Yard and Blissville or Maspeth Yard in western Queens), all of which have been or are currently used for rail activities. While the construction at each of these facilities would, for the most part, not involve extensive subsurface work, there is still potential for the disturbance of contaminated soil and to a lesser extent groundwater. Therefore, each of these sites was assessed for potential impacts related to contaminated materials. The site on Roosevelt Island that would be excavated to construct a substation facility for project's tunnel was also considered with respect to the potential for contaminated soils or groundwater.

POTENTIAL CONTAMINANTS OF CONCERN

Soil and groundwater beneath a site can become contaminated because of past or present uses on the site or on adjacent properties. Most of the sites affected by the project are currently in railroad use. Normal operations at rail yards—including maintenance and routine operations—can over time lead to contamination from minor spills, dripping and leaking of fluids, etc. In addition to contamination resulting from the rail uses themselves, the project areas may also have been contaminated by past or current uses of neighboring properties, particularly since most of the affected sites are located in largely industrial and manufacturing areas. Some contaminants, like petroleum products, may have been released during spills and from leaking underground fuel tanks. Others, such as polycyclic aromatic hydrocarbons (PAHs), are associated with combustion (e.g., coal, ash) and have historically been used as fill throughout

New York City. Some of the common contaminants of concern on rail yards and sites in industrial areas are discussed below.

- Polychlorinated Biphenyls (PCBs). Commonly used as a dielectric fluid in train-mounted or yard transformers, this pollutant is of special concern at some yard and train maintenance locations.
- Heavy metals, including lead, cadmium, chromium, and mercury. Widely used in many industries, including printers, foundries, and metal working facilities, and as components in paint, ink, petroleum products, and coal ash, these can be toxic to humans in high doses. Lead is also a component of paint on bridges, and can be found in elevated concentrations in soil near busy roadways as a result of the historic use of leaded gasoline. Heavy metals are of concern at the project areas because of rail maintenance activities and because of the surrounding industries.
- Volatile Organic Compounds (VOCs). These include aromatic compounds (such as benzene, toluene, ethylbenzene, and xylene [BTEX]), which are found in petroleum products used in vehicle repair and metal works, as well as many other industries; and chlorinated compounds (such as tricholoroethene and tetrachloroethene, common ingredients in solvents and cleansers) used in degreasing, dry cleaners, and other industrial facilities. Drinking water contaminated with VOCs or breathing or inhaling the vapors of VOCs can be toxic, and some VOCs can be flammable if the vapors are confined.
- Semivolatile Organic Compounds (SVOCs). These include PAHs, which are common constituents of partially combusted coal or petroleum-derived products, such as creosote used as a protective coating on rail ties and by chemical manufacturing facilities; coal and coal ash used as fill material; and phthalates, used in plastic manufacturing facilities. PAHs can pose long-term risks to human health.
- Pesticides and Herbicides. These are commonly used to eliminate rodents and/or insects, and vegetation from the rail yard, particularly between the tracks in the path of moving trains.
- Fuel Oil and Gasoline Storage Tanks. Many of the rail yards, businesses, and industries once located in the project areas contained above-ground storage tanks (ASTs) or underground storage tanks (USTs) for fuels. Some of these tanks may have been removed, and in some locations, spills and leaks associated with such tanks may have occurred. Other tanks, although no longer in use, may remain buried in place in the project areas. Existing businesses and gasoline stations neighboring the rail yards may have petroleum storage tanks that are in active use. The soils and groundwater in proximity to fuel oil and gasoline storage tanks may be contaminated because of past leaks or spills. Fuel oil and gasoline from off-site sources may have migrated to the project areas, contaminating soil and groundwater on-site.
- Asbestos. Steam pipes in GCT and in buildings at Sunnyside Yard that would be acquired by the project may be coated with asbestos. When asbestos fibers become airborne and are inhaled by an individual, the respiratory tract may be damaged.

METHODOLOGY

For each location where construction activities could disturb potentially contaminated materials, a preliminary site assessment (Phase I) was conducted. Each Phase I employed a four-part investigation—past and current historical land use review, contaminated materials database and records research, a site inspection, and interviews with knowledgeable personnel—to determine the potential presence of contaminated materials on or below the site as well as the need for further detailed subsurface site investigations (Phase II).

The review of past and current land use began with research to determine the past uses on or within one block of the site in question. The research involved examining historic maps (Sanborn real estate atlases and fire insurance maps dating back to late 1800's) and/or aerial photographs for such uses as gasoline stations, electric substations, gasworks, chemical works, and other industrial uses that historically could have resulted in contamination of underlying soil.

Federal and state database and regulatory records were reviewed—including listings of hazardous materials spills, petroleum storage facilities, and state and federally listed hazardous waste sites—to determine the regulatory status of each site, adjacent properties, and properties within the surrounding area. Previous environmental reports for each yard, where available, were also reviewed.

A visual inspection of all accessible areas of each yard was performed to determine potential sources of contamination, including USTs; ASTs; objects that could potentially contain PCBs, such as transformers; and areas where hazardous materials were used, stored, treated, generated and/or disposed, such as maintenance facilities, debris piles, and areas of illegal dumping. The visual inspection also identified any staining, odors, or lack of vegetation, which can be signs of contamination.

Finally, interviews were conducted with knowledgeable individuals at NYSDEC, the Metropolitan Transportation Authority (MTA), the Long Island Rail Road (LIRR), Metro-North Railroad, Amtrak, and NYAR, and environmental personnel familiar with the ongoing remedial work at Sunnyside Yard. As described earlier, the project team is consulting with NYSDEC and Amtrak on an ongoing basis regarding issues related to contaminated materials at Sunnyside Yard.

Using this four-step preliminary site assessment (Phase I), areas of potential contamination were identified at each project location, and a soil and groundwater testing program (Phase II) was designed and performed to evaluate the presence of contamination. The location and depth of soil samples, as well as the need for groundwater samples, were based on the proposed construction limits in each area. This included both shallow and deep sampling. A motorized drill rig was used to install deep soil borings, several of which were completed as permanent groundwater monitoring wells. Shallow soil borings (less than 4 feet) were installed using a drilling or hand auger and test pits were excavated using a backhoe. Soil and groundwater were tested for organic compounds, heavy metals, PCBs, and pesticides. The soil and groundwater samples were evaluated using the criteria described below.

REGULATORY LIMITS AND REGULATIONS/EVALUATION CRITERIA

The Phase I and II data were evaluated, focusing on whether the project could lead to exposure to contaminated materials that would result in an increased threat or risk to workers, public health, or the environment. The Phase II evaluations (soil and groundwater sampling) were used to determine the levels of various chemical constituents in soil and groundwater. These levels were then evaluated using criteria based on various regulatory limits, as appropriate for industrial sites. (Health-based criteria developed for residential areas and standards for drinking water were not used, since these are not appropriate for industrial sites that are not accessible to the general public on a regular basis.) These values serve as screening levels, with contamination identified at levels below the screening level not requiring further evaluation, and contamination above the screening level indicating the need for mitigation. (In addition, as described later in this chapter, any material that must be removed from a project site for disposal off-site will undergo a separate evaluation of contamination to meet off-site landfill requirements.) The criteria used to evaluate contaminants are described below and listed in Table 14-1.

Table 14-1

Project Evaluation Criteria

Matrix	Parameter	Value	Source
Soil	Lead	1,000 ppm	NYSDEC criteria at Sunnyside Yard
	Total VOCs	10 ppm	TAGM 4046
	Total SVOCs	500 ppm	TAGM 4046
	Individual SVOCs	50 ppm	TAGM 4046
	Total PCBs	25 ppm	NYSDEC criteria at Sunnyside Yard
	Total cPAHs	25 ppm	NYSDEC criteria at Sunnyside Yard
	Total Pesticides	10 ppm	TAGM 4046
Groundwater	Cadmium	0.69 mg/l	NYC Sewer
	Copper	5 mg/l	NYC Sewer
	Lead	2 mg/l	NYC Sewer
	Mercury	0.05 mg/l	NYC Sewer
	Nickel	3 mg/l	NYC Sewer
	Zinc	5 mg/l	NYC Sewer
	Numerous individual compounds	Various	NYSDEC Surface Water Standards

SOIL

- For lead, an evaluation criterion of 1,000 parts per million (ppm) was used, in accordance with values established by NYSDEC in effect at Sunnyside Yard (a New York State Inactive Hazardous Waste Site).
- For organic chemicals—i.e., VOCs, SVOCs, pesticides, and PCBs—comparisons were made with values obtained from NYSDEC guidance documents and criteria established by NYSDEC for Sunnyside Yard. The maximum criteria for classes of chemicals presented in NYSDEC's Technical and Administration Guidance Memorandum (TAGM) 4046 were used, as follows: total VOCs, 10 ppm; total SVOCs, 500 ppm; individual SVOCs, 50 ppm; and total pesticides, 10 ppm. (TAGM 4046 also has health-based criteria for specific chemicals, rather than classes of chemicals, but these are not appropriate for an industrial site that is not accessible to the general public. Health concerns during construction would be separately addressed by a Health and Safety Plan, as detailed below.) In addition to the criteria established by TAGM 4046, other criteria for organic chemicals established by NYSDEC for Sunnyside Yard were used. These are for total PCBs, 25 ppm; and total carcinogenic polycyclic aromatic hydrocarbons (cPAHs), 25 ppm.

GROUNDWATER

- For metals, total (unfiltered) levels were compared with New York City Sewer Ordinance requirements, and dissolved (filtered) levels were compared with NYSDEC-designated water quality standards of the closest surface water body (e.g., Highbridge data were compared with water quality standards applicable to the Harlem River).
- For organic chemicals (VOCs, SVOCs, and PCBs), levels were compared with NYSDEC-designated water quality standards of the closest surface water body. The New York City Sewer Ordinance also limits discharge of groundwater with oil and grease that would generally be visible as an oil sheen on the surface of the water.

B. EXISTING CONDITIONS

The following assessment summarizes conditions at locations of interest, based on the results of the Phase I and II investigations. More information is provided in the hazardous materials reports that are supporting documents to this DEIS.

MANHATTAN ALIGNMENT

This site has been in railroad usage since the mid-19th century. Historical real estate atlases and drawings from Metro-North Railroad indicate an oil storage vault located at East 48th Street between Madison and Park Avenues; a rail car servicing pit and associated sump pit located in the Madison Yard; and several USTs containing gasoline, fuel oil, and other oils on the east side of this area.

A release of 90 gallons of PCB-containing oil from a transformer on the underside of a train was reported on the upper-level Metro-North tracks in 1993. This is listed on the state spills database as a "closed" spill, indicating that NYSDEC determined that the necessary remediation was performed.

Suspect friable asbestos-containing material (ACM) from spray-on fireproofing was noted on beams in GCT during the site inspection. Although most pipe-insulating materials were fiberglass, there may be asbestos associated with underground utilities, such as transit conduits.

Based on the preliminary site assessment, a comprehensive site investigation (Phase II) was performed that included the collection of 31 subsurface soil samples, six concrete chip samples from the Madison Yard area, and one sediment sample from near a drain in Madison Yard. The soil boring locations were selected to best assess the impact of railroad activities on areas where soil excavation for the project may be necessary. Concrete chip samples were collected in areas of Madison Yard where concrete staining was evident and analyzed for PCBs. Due to the large quantity of sediment remaining in the drains of the yard area, a sediment sample was collected to investigate whether any contaminants were present. None of the samples collected at GCT were analyzed for pesticides/herbicides.

The Phase II investigation found elevated levels of total SVOCs (2,392.6 ppm at one boring location. In particular, several total PAHs (26-703 ppm), were found in five boring locations at shallow depths (0-3.5 feet). At three locations, these chemicals were typical of coal or coal ash, but at two others, they were consistent with petroleum contamination. Elevated levels of lead were also detected at 1,050 and 1,330 ppm at two boring locations at shallow depths (0-2 feet), and at 3,900 and 1,580 at two additional soil boring locations in deeper samples (8-12 feet). The contamination levels identified in the investigation are typical of sites in industrial or transportation (rail) use in an urban area, and do not pose a significant threat to the environment.

SUNNYSIDE YARD

Sunnyside Yard was created for and has been occupied by railroad use since the first decade of this century. Activities here include maintenance and rail car repair facilities, switch towers, car-washing facilities, and transformer yard areas. The yard is listed as a Class II Inactive Hazardous Waste Site by NYSDEC and had widespread contamination from petroleum and PCBs. Petroleum contamination occurred over a number of years due to leaks from several USTs containing diesel and fuel oil. PCBs have likely leaked from stationary transformers and from transformers mounted on cars and locomotives. Previous subsurface investigations have established the presence of an approximately 200,000-gallon plume of PCB-contaminated oil floating in the groundwater (this plume is "separate-phase" because it is floating separately in the groundwater) approximately two to seven feet beneath Sunnyside Yard. As shown in Figure 14-1, this plume is in the northeast portion of the yard, near Northern Boulevard and 38th Avenue. Although the groundwater beneath Queens is designated as a sole source aquifer, groundwater in this part of Queens is not used as a potable source of water.

The surrounding area has been a major industrial and manufacturing center, interspersed with warehouse/distribution facilities since Sunnyside Yard was built. The adjacent properties have included metal-working facilities, mechanics and electronics manufacturers, and auto-related facilities. Several of these facilities are on state and federal regulatory listings and have reported spills to NYSDEC. Previous investigations indicate three plumes of chlorinated solvent-contaminated groundwater and one plume of BTEX (four chemicals associated with gasoline) in groundwater extending onto the project site, most likely from neighboring industrial facilities.

The Honeywell Street bridge is listed as a State Hazardous Waste Generator of lead waste, most likely for the removal of lead paint from the bridge. Lead paint may also be present on other bridges and metal structures. Elevated concentrations of lead may be present in soil under the bridges at Sunnyside Yard, as well as at Yard A.

A site investigation was performed that included the completion of 39 shallow soil borings (less than 6 feet), and 14 deeper soil borings (up to 20 feet), four of which were completed as permanent groundwater monitoring wells. Boring and monitoring well locations were placed in the areas where historical uses and off-site facilities could potentially have affected soil and groundwater at the project site, limited to areas of proposed construction. Sampling locations are indicated in Figure 14-1.

Elevated levels of total PAHs were detected in soil samples at two locations in the yard, including one shallow sample in the loop track area (39 ppm), specifically in the vicinity of a plume of BTEX found during previous investigations, and one deeper sample in the Harold Interlocking area (708 ppm). Elevated levels of total SVOCs (1,418 ppm) were also found in this sample. With the exception of the portion of the site listed as an Inactive Hazardous Waste Site, overall, the contamination levels identified in the investigation are typical of sites in industrial or transportation (rail) use in an urban area.

YARD A

Like Sunnyside Yard, Yard A has been in rail use for more than 90 years and maintenance operations have taken place since at least 1980. Several piles of debris and illegally dumped material, including 55-gallon drums of unknown content, were observed throughout the site. Drums have the potential to leak their contents to surrounding soil, or liquid waste may have been illegally dumped directly into the soil.

In addition, several spills have been reported at adjacent industrial properties to the north, including one spill of gasoline at a filling station, and one spill of creosote at the "Outlet City" site,* located on Queens Plaza South, adjacent to Yard A. In addition, a release of diesel fuel was reported at the New York City Transit (NYCT) building just north of Yard A in 1994 after an underground storage tank was discovered during an excavation. A second spill of an unknown quantity of diesel, kerosene, mineral spirits, and waste oil was reported at this facility in 1996. Both spills are listed on the state spills database as "active" spills. Previous reports revealed the presence of four plumes of contaminants in the groundwater beneath Yard A. In addition to a portion of the large plume of free-floating, PCB-containing oil (discussed above under "Sunnyside Yard"), they include three other plumes of dissolved contaminants at lower concentrations—two plumes of chlorinated, solvent-contaminated groundwater extending to the project site, most likely originating from neighboring manufacturing facilities; and one plume of BTEX (four chemicals associated with gasoline) extending to the project site from a neighboring filling station.

The site investigation of Yard A consisted of 14 soil borings, 7 of which were completed as groundwater monitoring wells (see Figure 14-1 for sampling locations). Elevated levels of SVOCs—in particular PAHs as naphthalene (1300 ppm), methylnapthalene (770 ppb), acenaphthene (180 ppb), fluorene (84 ppb), and phenanthrene (65 ppb), and some methlphenols (75 ppb, total)—and VOCs (BTEX, 503 ppb, total) were detected in the groundwater samples at the monitoring well location adjacent to the Outlet City site. Although the chemicals found would normally be associated with gasoline or other petroleum products, based on a detailed review of the on-site Outlet City data, they most likely represent creosote and not petroleum. The Outlet City site is currently undergoing remediation of creosote floating on groundwater under a voluntary cleanup agreement wit the NYSDEC.

The elevated lead levels were detected in soil samples at three boring locations (at 1,200-2,440 ppm) at shallow depths (0-3 feet). One of these was located just north of the on-site maintenance facility, one was located in the vicinity of the Queens Boulevard bridge, and one in the vicinity of the Honeywell Street bridge. In addition, elevated lead levels were detected in two unfiltered groundwater samples (264 and 4 ppm), two of which were locations where elevated soil lead was also found, including the monitoring well in the vicinity of the Honeywell Street bridge and the monitoring well located just north of the maintenance facility. It is possible that both results are anomalous and are due solely to high turbidity, which would not be expected if dewatering were to occur at these locations, as levels were significantly lower (0.031 and 0.006 ppm) in the filtered samples. The contamination levels identified in the investigation are typical of sites in industrial or transportation (rail) use in an urban area, and do not pose a significant threat to the environment.

BLISSVILLE YARD

Blissville Yard, now vacant, was in rail use for many years, and it is located in a major industrial and manufacturing area in Queens. During that time, the surrounding properties have included

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* Also known as the QP site and the West Disinfecting Co.

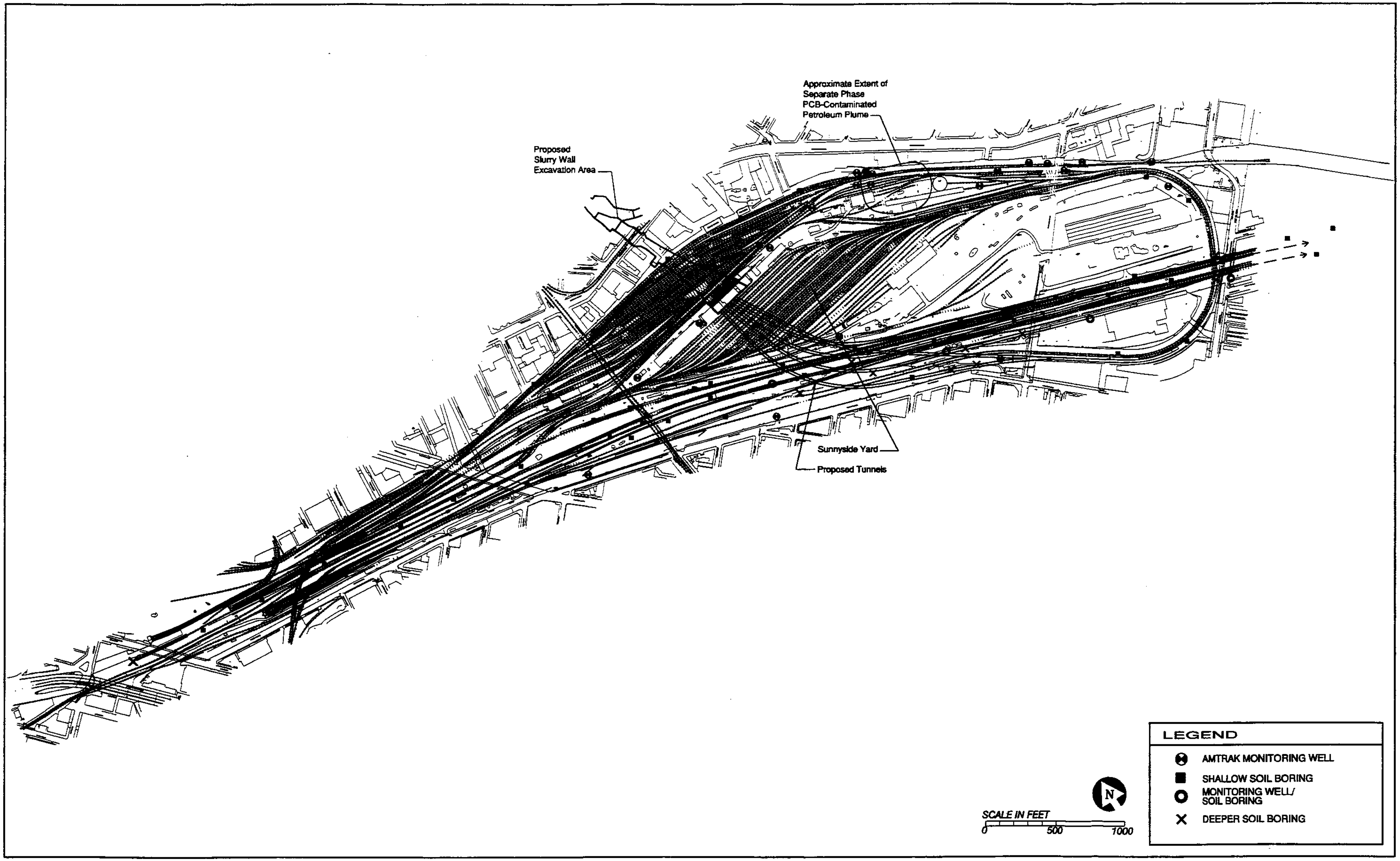
Approximate Extent of Separate Phase PCB-Contaminated Petroleum Plume
Proposed Slurry Wall Excavation Area
Sunnyside Yard
Proposed Tunnels
SCALE IN FEET
0
500
1000
N
LEGEND
AMTRAK MONITORING WELL
SHALLOW SOIL BORING
MONITORING WELL/ SOIL BORING
DEEPER SOIL BORING

Figure 14-1
Sampling Locations at Yard A / Sunnyside Yard

metal-working facilities, fuel oil distribution facilities, and chemical-manufacturing facilities. Two spills were reported at the Buckeye Pipeline facility, south of the project site. Nearly 2 inches of separate-phase gasoline was found at an existing monitoring well at this facility. Two spills were reported at adjacent auto repair facilities to the north, including one 100-gallon spill of fuel oil and one spill of an unknown quantity of petroleum. Several piles of debris and illegally dumped material, including 55-gallon drums of unknown content, were observed throughout the site.

A site investigation was conducted consisting of seven shallow (less than 3 feet), hand-augered soil borings, as project-related work proposed at Blissville Yard would only disturb the surface. Boring locations were placed at approximately 250-foot intervals through the length of the yard. Lead was found at elevated levels (1030 ppm) at one location in the central portion of the yard. The contamination levels identified in the investigation are typical of sites in industrial or transportation (rail) use in an urban area, and do not pose a significant threat to the environment.

MASPETH YARD

This site has been in railroad usage since before 1902. Historical real estate atlases indicate that a tool shed has occupied the site since the 1950's, and one vent pipe was observed adjacent to the tool shed during the site inspection. Two buildings and one gas tank were shown on maps from 1936 to 1950. Although no train maintenance activities are performed at the yard, such activities may have been performed in the past.

One spill of 75 gallons of diesel fuel was reported on-site after an LIRR train collided with a tractor trailer at the intersection of Maspeth Avenue and Rust Street in 1995. This spill is still considered "active" by NYSDEC, indicating that it has not been fully remediated. Two additional spills were reported at off-site-adjacent properties, including a PCB oil spill in 1997 at the adjacent Con Edison substation and a petroleum spill after a tank failure at 1 Railroad Place, also known as 2 Galasso Place, located immediately southwest of the center of the yard. Free product (i.e., a separate layer of material floating on top of the groundwater) was found in at least one monitoring well that was subsequently installed at the neighboring bus facility, located at 3 Galasso Place. Groundwater conditions on the project site may have been affected by these facilities.

The site investigation consisted of seven soil borings, three of which were completed as groundwater monitoring wells. Elevated levels of SVOCs (27 ppm) common to petroleum were found at one boring location at depths of 10-12 feet, in the vicinity of the adjacent 2 Galasso Place spill. Lead was found at elevated levels at the two neighboring boring locations (3,950 at 10- to 12-foot depths and 3,050 ppm at 2- to 4-foot depths) in the vicinity of the adjacent 3 Galasso facility, and one at the boring location at the northwest corner of the yard (1,770 ppm at depths of 2-4 feet). Sampling near the area of the diesel fuel spill on-site did not indicate contamination. Groundwater conditions were below screening levels. The contamination levels identified in the investigation are typical of sites in industrial or transportation (rail) use in an urban area, and do not pose a significant threat to the environment.

FRESH POND YARD

Historical aerial photographs do not reveal evidence of significant environmental hazards on the project site or in the surrounding area. However, the site has been an active rail yard since at least 1910. No train maintenance facilities were located at Fresh Pond Yard, and a review of federal and state regulatory listings did not indicate any significant environmental hazards on the project site or surrounding areas.

No significant concerns based on the site history or surroundings were identified at Fresh Pond Yard, and the only work proposed would disturb the surface. To evaluate further potential for contamination in this area, six shallow (less than 3 feet), hand-augered borings were installed in the vicinity of proposed construction. Elevated levels of VOCs (23 ppm) consisting of trichloroethene and dichloroethene, common chlorinated solvents used in degreasing, were found at one boring location at the eastern portion of the parking lot. Like the other yards studied, the contamination levels identified in the investigation are typical of sites in industrial or transportation (rail) use in an urban area, and do not pose a significant threat to the environment.

HIGHBRIDGE YARD

Highbridge Yard has been in railroad use for more than 100 years. Historical maps indicated rail car repair shops in several locations throughout the site. Rail car repair facilities may have contaminated underlying soil and groundwater with PCBs, waste oil, and diesel fuel. Eight fill caps and seven cut-off vent pipes associated with USTs were observed during the site visit. Real estate atlases also revealed additional USTs. Old underground gasoline tanks may no longer be in use, but often remain in place and have the potential to leak contents into the surrounding soil. Several piles of debris and dumped material, including 55-gallon drums of unknown content, were observed at the site. Previous investigations indicated elevated levels of methylene chloride and several SVOCs in groundwater samples. Trace levels of PCBs and SVOCs were also detected in several soil samples in previous investigations.

A site investigation was conducted consisting of two test pits and eight soil borings, three of which were completed as permanent groundwater monitoring wells. Boring and monitoring well locations were placed in the areas where historical uses and off-site facilities could potentially have affected soil and groundwater at the project site.

No contaminants of concern were found in levels greater than relevant standards and guidance values. However, during test pit excavations on the east side of the railroad tracks, two 55-gallon drums were encountered, one of which was inadvertently ruptured. The drum contained a strong alkali (potassium hydroxide). The spill was immediately cleaned up and reported to NYSDEC in accordance with NYSDEC and U.S. Environmental Protection Agency procedures. Other drums were noted or suspected in the northeastern portion of the site. It is suspected that the drum was dumped illegally at the site from an off-site source.

A spill was reported during the Phase II investigation after evidence of petroleum contamination was observed during sampling. Nine tanks were subsequently closed and removed by Metro-North in accordance with state guidelines.

The contamination levels identified in the investigation are typical of sites in industrial or transportation (rail) use in an urban area, and do not pose a significant threat to the environment.

ROOSEVELT ISLAND

This site has been occupied by a subway vent associated with the 63rd Street Tunnel since the 1970's. Prior to that, the project site has been occupied by vacant land and a structure of unknown purpose. The neighboring properties have included a quarry, a reservoir, residences, a laundry facility, a fire house, a garage, and two additional auto-related buildings. These would not be expected to have affected subsurface conditions on the project site. Further, it is likely that much of the soil at the project site was removed during the excavation of the on-site subway vent. No spills were reported within an -mile radius of the project site, and State and Federal regulatory review did not reveal any significant environmental hazards on the project site or the surrounding area.

Given that there were no significant concerns at the Roosevelt Island study area, no subsurface investigation has been recommended.

C. FUTURE CONDITIONS COMMON TO ALL ALTERNATIVES

In the future, it is expected that two current remediation projects could significantly improve groundwater contamination in the Sunnyside Yard/Yard A area. Amtrak, under a consent order with NYSDEC, is proceeding with remedial measures to remove the separate-phase PCB-contaminated petroleum plume in Sunnyside Yard and Yard A. Currently, a passive recovery (skimmer) system is in place that collects the contaminated material floating on top of the groundwater. Over the next several years, it could be expected that most of the contaminated material would be removed.

At the Outlet City site, located north-adjacent to Yard A at the western portion of the yard, the owner is remediating the creosote contamination as part of NYSDEC's Voluntary Cleanup Agreement Program. A smaller groundwater treatment system than the one used by Amtrak is currently in place and negotiations are underway to select a final remedial measure.

D. PROBABLE IMPACTS OF THE PROJECT ALTERNATIVES

The presence of hazardous or contaminated materials threatens human health only when exposure to those materials can occur. During construction, the East Side Access Project would require excavation and disturbance of soil and groundwater. In areas where contamination exists, disturbance of soil and groundwater can provide an exposure pathway for the contaminants to workers and the public. This would vary depending on construction depth and methods, as discussed below. As also described below, once construction activities are completed, mitigation measures would address any remaining subsurface contaminated materials, and thus would eliminate the potential for any adverse impacts during the operational phase of the proposed project.

The potential environmental impacts associated with each project alternative are examined below. Where potential impacts are identified, possible mitigation measures are presented in section E, "Mitigation Measures."

NO ACTION ALTERNATIVE

There are no excavation or construction activities associated with the No Action Alternative and therefore this alternative would have no hazardous materials impacts.

TSM ALTERNATIVE

There would be very little subsurface construction activity (e.g., foundations for extended bus lane, the expansion of platforms, minimal surface track work at some LIRR stations) associated with the TSM Alternative. Construction over wider or deeper areas would occur if the TSM components providing contraflow bus/taxi lanes were implemented. In these instances, impact potential would be similar to, but likely less than, that of the Preferred Alternative, as discussed below. In addition, construction of this alternative would require a NYSDEC-approved Health and Safety Plan (HASP), and might also require Phase I and II assessments at specific locations.

PREFERRED ALTERNATIVE

POTENTIAL IMPACTS DURING CONSTRUCTION

Although proposed plans for each location of concern differ, construction issues are similar, and include surface construction, soft-ground tunneling and cut-and-cover construction, and hard rock tunneling. Different impacts for different types of construction are described below. The specific issues identified at each project location are also addressed below.

The hazardous materials assessment undertaken for this EIS identifies contaminated areas for the purposes of identifying potential significant impacts and appropriate mitigation measures. For all project areas, prior to any additional environmental investigation or construction, an environmental Health and Safety Plan (HASP) would be created to provide guidance related to hazardous materials or chemicals that may be encountered. This is discussed in more detail below under "Mitigation Measures." After the design of project elements is more fully developed and prior to the start of construction, additional soil and groundwater sampling would be undertaken in all project construction areas where contaminated materials were identified. This additional work would be designed to characterize the nature, approximate quantity, and extent of contaminated materials at all construction areas. This would be undertaken to address worker safety and to identify any soil or groundwater that would require special off-site disposal.

Surface Construction: All Locations

Surface construction includes activities such as laying new track, adding or relocating utilities and signals, and the construction of maintenance and other ancillary facilities. This would occur at Blissville or Maspeth Yard, Highbridge Yard, and in some portions of the Yard A/Sunnyside Yard area. During construction, contaminated soils could be exposed. Airborne dust during construction activities is the main pathway for contaminants to reach nearby residents and construction workers. An environmental HASP would be created for each site to minimize potential exposure to contaminated materials, as discussed under "Mitigation Measures," below.

While most of the project sites do not require any special measures, localized pockets of contamination or underground fuel storage tanks could be encountered during excavating and grading activities at any of the rail yards. These would be tested and disposed of properly, as discussed in "Mitigation Measures," below. Debris and dumped materials would also be removed from the sites and disposed of properly.

As discussed above, there is also the potential to encounter buried drums. Drums and any contaminated soils would be tested and removed with caution, in accordance with the HASP. If tanks or drums are removed according to regulations and the HASP, no significant impact would occur. It is expected that any drums found during the pre-construction site investigation would be removed immediately. The HASP would include measures to be employed should any drums be encountered at any of the project sites.

Soft-Ground Tunneling And Cut-and-Cover Construction: Sunnyside Yard and Yard A

In Queens at Yard A and Harold Interlocking, construction activities would include excavation and soft-ground tunneling techniques. As described above under "Existing Conditions," Amtrak's Sunnyside Yard has been designated by NYSDEC as a Class II Inactive Hazardous

Waste Site. A plume of PCB-contaminated oil has been identified in the groundwater beneath Sunnyside Yard and Yard A. Special care would be taken at Sunnyside Yard, including ongoing coordination with Amtrak and NYSDEC, to ensure that the project would not interfere with any remediation efforts at the yard. In addition to using special construction techniques at Yard A, the project would construct tunnels deep beneath Sunnyside Yard to avoid affecting contaminated areas in any way.

Soft-ground tunneling and cut-and-cover construction proposed for Sunnyside Yard and Yard A would require the excavation of large amounts of soil. Subsurface investigations indicate that deep excavation is less likely to encounter contaminated soil; however, if contaminated soil is encountered, it would be mitigated as described above and in "Mitigation Measures," below.

As described earlier, Amtrak is currently performing remediation for contamination at Sunnyside Yard. Since Amtrak's remediation systems are currently removing PCB-contaminated oil, and construction of the East Side Access Project would not begin for several years, it is highly possible that Amtrak will have completed cleanup of the plume prior to project construction. If the remediation is not yet complete, project-related construction work below the water table could encounter the plume of separate-phase PCB-contaminated oil detected in groundwater at Yard A and Sunnyside Yard. Typically, when earth is excavated to a depth below the groundwater level (as would be the case in Yard A), water continually seeps into and is pumped out of the area of excavation. At Yard A, this groundwater could be contaminated, and as groundwater continued to fill the excavation pit, the new "current" created in the groundwater flow beneath the yard would likely draw the contaminated plume toward the excavation area. (This current is referred to as "drawdown"). To avoid the potential issues related to this exposure and to avoid moving the plume, project-related excavation in Yard A would use a slurry cut-off wall with limited permeability to minimize the amount of dewatering, as explained below.

As described in more detail in Chapter 17 ("Construction and Construction Impacts"), the work at Yard A would begin with excavation of a large area. Soil and groundwater would be removed from this area, tested, and disposed of properly, as explained below under "Mitigation Measures." The excavation area would then be enclosed with virtually watertight walls constructed using slurry and jet grout. This new excavation area would thus provide a protected location for construction activities, separate from the contaminated groundwater beneath the yard. Figure 14-2 illustrates the proposed location of the new "cut-off" wall.

Since the slurry wall would have a much lower permeability than the surrounding soil, potential effects on the water table would be minimized. With only a small change in water table elevation, increases in groundwater flow and the need for dewatering of the excavation area would be minimized. A conservative, two-dimensional mathematical model of groundwater conditions in the yard has concluded that the drawdown at the plume would not exceed 3 feet for this project. In addition, the potential movement of the PCB-contaminated plume in Sunnyside Yard seems to be further restricted by a sewer structure on its northern boundary.

This type of cut-off wall was used for MTA New York City Transit's 63rd Street Connector Project along Northern Boulevard, close to the area to be affected in Yard A. This cut-off wall, in similar soil conditions to that proposed for Yard A, was very effective at minimizing any migration of the plume. As shown in Figure 14-2, the 63rd Street Connector's cut-off wall is much closer to the PCB-contaminated petroleum plume than the one proposed for the Preferred Alternative in Yard A. Monitoring of the changes in groundwater elevation during construction of the 63rd Street Connector Project has revealed that maximum drawdown (i.e., the decrease in groundwater elevation) occurred adjacent to the cut-off wall. The monitoring wells adjacent to the contaminated plume exhibited very little change in elevation (less than 3 feet). Since the proposed East Side Access Project's cut-off wall would be much farther away from the plume, it is not expected to result in any significant drawdown at the location of the plume.

In addition, monitoring would be performed during construction to determine whether the plume moves. If it does move, water from dewatering could be reinjected to reduce drawdown or additional extraction wells or slurry walls could be installed to capture PCB-contaminated oil. During construction, the HASP would specify precautions to be taken to minimize worker contact with groundwater, including the use of safe work practices and protective clothing.

Dewatering

State and city regulations restrict the pumping of contaminated groundwater to rivers or sewers. The project specifications for dewatering would include testing to ensure that regulatory levels are not exceeded and that, therefore, no significant impacts would occur. Based on groundwater sampling performed to date, all groundwater (other than the PCB-contaminated Plume at Sunnyside/Yard A) could be pumped to sewers without further treatment. However, settling basins may be required at Yard A to reduce levels of suspended metals. At Highbridge, the only likely site where discharge to surface water is feasible, sampling results indicate that, if necessary, groundwater could be pumped to the Harlem River without treatment. If dewatering to the river is necessary at Highbridge, a testing program and site-specific discharge limits would be developed with NYSDEC. (For more information, see Chapter 15, "Natural Resources.")

Hard Rock Tunneling: Manhattan Alignment

Sections in Manhattan where hard rock tunneling techniques would be utilized would not be expected to encounter any contamination, since Manhattan bedrock is relatively unfractured and impervious, thus minimizing the potential migration of water or oil that may transport contaminants into the bedrock. The issues would be the same for the project's Option 1 (new tracks and platforms on Grand Central Terminal's lower level) as for Option 2 (new tracks and platforms below the lower level). Both would use hard rock tunneling techniques to create the new tunnels, and both would involve work in the area of Madison Yard, where care would be taken in handling the soil and ballast there. To ensure worker safety, a HASP would be implemented.

Demolition: All Locations

Any asbestos or contaminated materials found in structures to be demolished would be removed prior to demolition, according to all applicable state and local regulations.

POTENTIAL IMPACTS DURING OPERATION

The mitigation measures implemented during construction would ensure that any contaminated materials currently present on the project sites would not result in significant adverse impacts once the project's construction is complete and the East Side Access Project is operational. As described earlier, in Yard A and Sunnyside Yard, the project would be constructed to avoid any effects on the contaminated plume beneath the yards; groundwater modeling performed for the project has concluded that the project would not significantly affect the groundwater conditions there. Furthermore, the new railroad-related facilities created as part of the project would comply with all applicable regulations regarding contaminated materials, to avoid creating new contamination at any of the project sites. As detailed in Chapter 15 ("Natural Resources"), for

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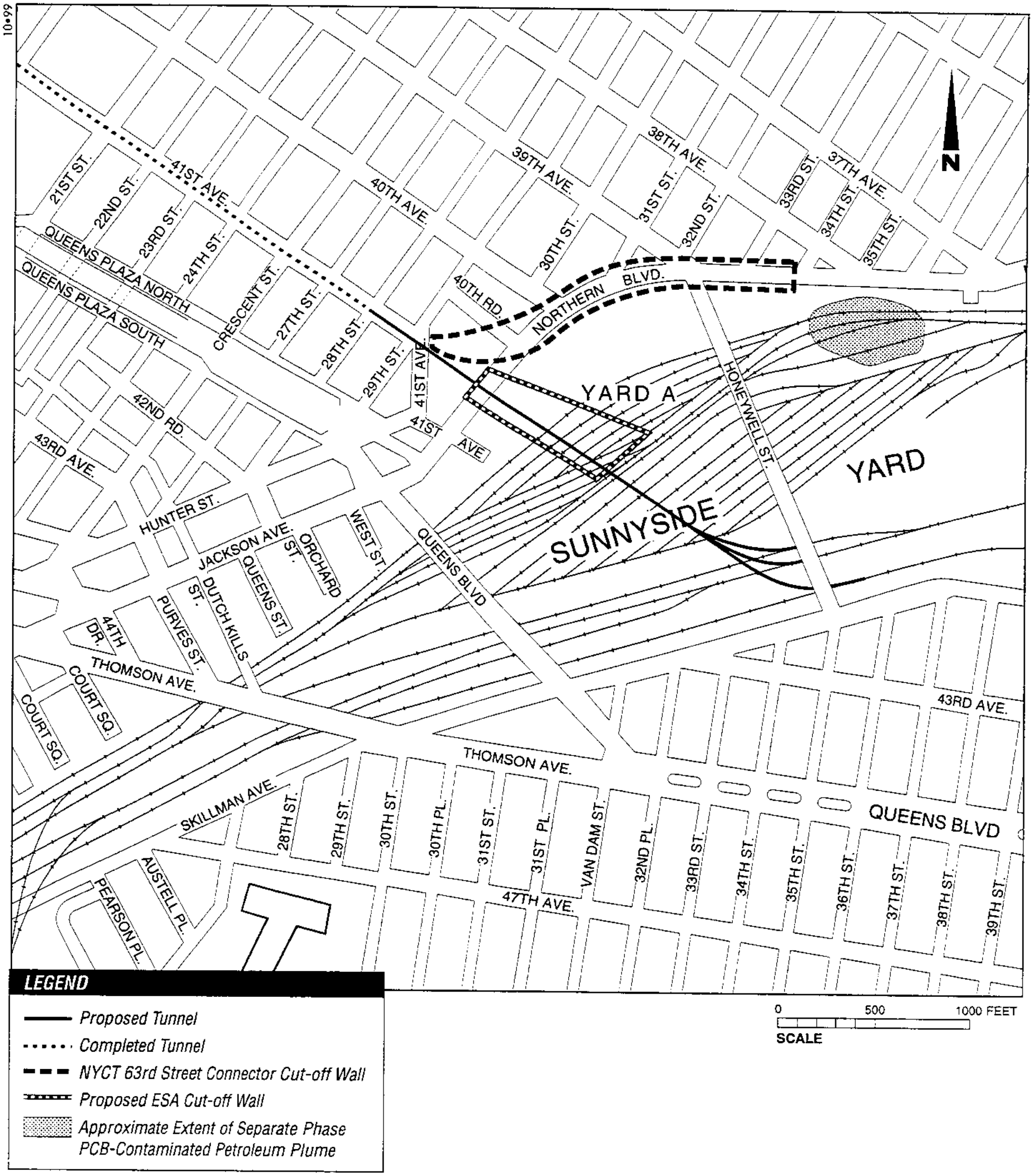

Figure 14-2

ESA and NYCT Cut-off Walls

example, the project would include pre-treatment systems for any discharges from its maintenance facilities, as required by local laws. Overall, operation of the proposed project would not result in significant adverse impacts related to contaminated materials.

E. MITIGATION MEASURES

Mitigation measures required for project construction are not extraordinary, but they would be applied widely, as the need arises. As described above, prior to any work on the project sites, HASPs would be created to provide guidance related to hazardous materials or chemicals that may be encountered in project construction areas. After the design of project elements is more fully developed and prior to the start of construction, additional soil and groundwater sampling would be undertaken in all project construction areas where contaminated materials were identified. This additional work would be designed to characterize the nature, approximate quantity, and extent of contaminated materials at all construction areas. This would be undertaken to address worker safety and to identify any soil or groundwater that would require special off-site disposal.

All critical activities would be defined early, in the HASP prepared for each construction phase and location. The East Side Access Project team would develop specifications for the HASP, which would have to be carried out by the contractors selected to perform the construction. The purpose of the HASP is to protect the public and workers from any contamination found in the soil and groundwater. The plan would establish methods to limit site access, include an air monitoring program for particulates (dust) and VOCs, and would set standard safe operating procedures for the construction crew. The plan would also outline criteria to be used to identify non-routine and potentially dangerous conditions, such as petroleum odors, oil sheens, and discolored soil and groundwater.

The approach to mitigation of soil and groundwater conditions, as well as specific requirements for fuel tank and asbestos removal in accordance with all applicable regulations, are as follows:

- Additional environmental investigations would be conducted to determine the horizontal and vertical extent of contamination with the vicinity of construction.
- Potentially contaminated soils would be excavated and stockpiled on polyethylene sheeting until they could be tested and if necessary, removed for off-site disposal at an appropriate facility. Depending on the quantities and locations of contaminated soils, other mitigation technologies may be used, such as soil vapor extraction for VOCs and capping for metal contamination.
- As part of the construction documents and included in the HASP would be methods to be employed should any fuel oil tanks be encountered during construction. They would be closed and removed in accordance with state and city regulations, along with any associated contaminated soils or separate-phase petroleum. The steps to be followed include removing any remaining product and contaminated water, and evacuating any vapors from inside the tanks. Tanks would then be cleaned and properly decommissioned, then hoisted from the ground for off-site disposal. Vents or pipe runs would also be removed in conjunction with the tanks. Soil from around the tank would be sampled to identify contamination, and any contaminated soil would be excavated and removed by a certified hauler to an appropriate disposal facility. Once contaminated soil has been excavated, soil samples would be collected from the sides of the excavated area to confirm all contaminated soil has been removed.

- At locations where construction requires demolition, a comprehensive asbestos survey of each structure would be conducted in the safe and accessible areas that includes the sampling of all suspect materials to confirm the presence or absence of asbestos. Based on the findings of the survey, ACMs would be removed in accordance with all local, state, and federal regulations.

- Groundwater mitigation would include ongoing monitoring and treatment of water removed during dewatering operations, and monitoring the plume of separate-phase PCB-contaminated oil in Sunnyside Yard to assure there is no migration into the project area. The use of slurry walls or groundwater reinjection techniques may be employed to mitigate contaminated groundwater from entering the construction area.

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Chapter 15: Natural Resources

A. INTRODUCTION

This chapter considers the project's effects on natural resources. Resources evaluated include wetlands, water quality, floodplains, navigable waters, the coastal zone, ecologically sensitive areas (such as significant habitats), endangered or threatened species. The chapter considers these resources in areas where any of the project alternatives could affect them—locations where at-grade construction or operational activities would occur. The tunnel elements of the Preferred Alternative in Manhattan and in Queens would not have the potential to affect natural resources, since both construction and operations would occur below the ground. For areas that could potentially be affected, the chapter includes an evaluation of existing natural resources and their value, followed by an assessment of the specific effects on those resources of both construction and operation of project elements.

B. METHODOLOGY

ASSESSMENT APPROACH

The natural resource investigation focused on those locations where the project alternatives would involve construction activities that have the potential to result in significant adverse impacts. These areas include Grand Central Terminal (GCT) and the Manhattan tunnel alignment, the Sunnyside Yard/Yard A area, Maspeth Yard, Fresh Pond Yard, Blissville Yard, and Highbridge Yard. Effects of the proposed project on each of the following regulated resources was considered for each study area: wetlands, water quality, floodplain, navigable waters, coastal zone, ecologically sensitive areas, and endangered species. Detailed discussions of each of these resources follow in the next section.

To establish the existing conditions in the study area and baseline data for the assessment, the following research was completed:

- Identification of wetlands within the study areas. United States Geological Survey (USGS) Watershed Maps, New York State Department of Environmental Conservation (NYSDEC) freshwater and tidal wetlands maps, and U.S. Department of Interior (DOI) National Wetlands Inventory (NWI) maps were consulted to identify specific wetlands and waters within the area. The U.S. Army Corps of Engineers (COE) was contacted to establish the need for any permits or consultation required for the implementation of the project.
- Review of water quality conditions using New York State Best Use Classifications and New York City Department of Environmental Protection (NYCDEP) Harbor Water Quality Surveys, which document current and historic water and sediment quality conditions for the New York Harbor Area.
- Determination of floodplain encroachment in any of the study areas by reviewing Flood Insurance Rate Maps from the Federal Emergency Management Agency (FEMA).

- Review of National Oceanic and Atmospheric Administration (NOAA) maps of navigable waters for the water bodies with potential to be affected (East River, Newtown Creek, Dutch Kills, Maspeth Creek, and Harlem River).
- Determination of any project areas that fall within the Coastal Zone boundary by reviewing Coastal Zone maps published by the New York City Department of City Planning (NYCDCP).
- Review of database records for the project study areas at NYSDEC's Natural Heritage Program (NHP), NYSDEC's Significant Habitat and Endangered Species units, the U.S. Fish and Wildlife Service (FWS), the New York State Department of State (NYSDOS), and the National Marine Fisheries Service (NMFS).

REGULATED HABITATS

WETLANDS

In general terms, wetlands are lands that are at least periodically saturated with or covered by water. They are transitional lands between terrestrial and aquatic systems where the water table is usually at or near the surface or the land is covered by shallow water. While there are many types of wetlands distinguished by specific ecological characteristics, there are two fundamental wetland types: tidal and freshwater. Freshwater wetlands have no saline inputs, whereas tidal wetlands are regularly submerged by a salt water body. Wetlands are a valuable resource since they can be essential breeding, rearing, and feeding grounds for many species of fish and wildlife. They may also perform flood protection and pollution control functions.

Wetlands in New York State are regulated both by COE and NYSDEC. The COE regulates wetlands pursuant to Section 404 of the Clean Water Act (33 CFR Part 230), regardless of size. NYSDEC regulates freshwater wetlands that are 12.4 acres or larger, or, if the freshwater wetlands have unusual local importance, under their permit authority (6 New York Codes, Rules, and Regulations [NYCRR] Part 663). NYSDEC also regulates a protective buffer zone around the wetland, called the "adjacent area." The regulated adjacent area is 100 feet. State wetlands are depicted on USGS quadrangle base maps.

Tidal wetlands are also regulated by NYSDEC and the COE. NYSDEC's regulatory authority is contained in 6 NYCRR Part 661, and the COE's regulatory authority is contained in 33 CFR Part 330. In addition to tidal wetland resources, within New York City limits, NYSDEC regulates a protective 30-foot buffer and the adjacent area, which extends 150 feet from the regulated wetland boundary. As defined by 6 NYCRR Part 661.4(b)(1)(ii), if there is a functional and substantial fabricated structure that lies generally parallel to the landward-most tidal wetland boundary and that is a minimum of 100 feet in length, as measured generally parallel to such landward-most boundary, the seaward edge of this structure may represent the limit of the regulated wetlands and adjacent area.

WATER QUALITY

The issue of water quality encompasses coastal waters, tidal straits and rivers, freshwater lakes, ponds, and streams, in addition to the groundwater resources of Long Island, including groundwater. Issues of concern involve impacts during construction, such as those related to dredging and filling, dewatering, and discharge, as well as storm water and erosion control planning.

Surface Water

The Clean Water Act establishes objectives to provide "fishable and swimmable waters for the enjoyment of all." To this end, the NYSDEC has a system of use classifications and discharge standards as defined under 6 NYCRR Part 701. Use classifications set attainment goals, but do not necessarily indicate existing water quality conditions. For example, by classifying waters as SA (with "S" representing saline waters and "A" the highest classification), NYSDEC has set a management goal to achieve water quality capable of supporting shellfish harvesting.

The water quality classifications are shown in Table 15-1. All of these water quality classifications exist in nearby waters. The distribution of these water quality classifications makes some waters more sensitive than others to pollutant loadings due to the standards required to meet their intended uses.

Table 15-1
New York State Department of Environmental Conservation Surface Water Quality Classifications

Class	Best Usage of Waters
SA	Shellfishing for market purposes and primary and secondary contact recreation.
SB	Primary and secondary contact recreation and any other use except shellfishing for market purposes.
SC	Fishing, fish propagation, primary and secondary contact recreation although other factors may limit the use for that purpose.
I	Secondary contact recreation and any other uses except primary contact recreation and shellfishing for market purposes.
SD	Fish survival.

Groundwater

In addition to the surface waters that could be affected by the project described above, all of the project areas in Queens are located above an important groundwater resource. All of Queens County is located above U.S. EPA-designated Sole Source Aquifers. The aquifers supply all of the drinking water for Long Island and are vital to all of Long Island outside of New York City. In New York City, the aquifers have in the past been used for drinking, but currently are not used. NYCDEP is studying possible use of the groundwater as part of the New York City water supply system. If the groundwater under Queens were to be polluted, the drinking water supply on Long Island could be affected. In addition, the New York City Parks Department has applied non-potable groundwater for irrigation in parks in Queens.

ECOLOGICALLY SENSITIVE AREAS

Significant or unique habitats and landforms are regulated by NYSDEC, NYSDOS, and local authorities. Areas such as wetlands, groundwater recharge areas or primary aquifers, or habitats critical to spawning of fish and animal populations must be given close examination. The quality, rarity, human use, and wildlife of such areas will dictate the severity of potential impacts and the level of required mitigation, if necessary.

Critical Environmental Areas

NYSDEC has the authority to designate Critical Environmental Areas. These areas have unique ecological and environmental characteristics that are worthy of special protection. When a project is undertaken in or near a Critical Environmental Area, the project is considered to be a Type I under the State Environmental Quality Review Act (SEQRA) and "carries with it a presumption that it is likely to have a significant effect on the environment and may require an EIS." In New York City, the only Critical Environmental Areas are Jamaica Bay, its tributaries and tidal wetlands. This project is not located near Jamaica Bay, and tidal wetlands are discussed separately.

Significant Coastal Fish and Wildlife Habitats

NYSDOS has designated 15 Significant Coastal Fish and Wildlife Habitats in New York City under 6 NYCRR part 600. These habitats have been evaluated and rated by NYSDOS in cooperation with NYSDEC, and have to be "protected, preserved, and where practical, restored so as to maintain their viability as habitats." None of the project sites are located near any of the designated Significant Coastal Fish and Wildlife Habitats.

ENDANGERED, THREATENED, OR SPECIAL CONCERN SPECIES

Federal Legal Status—U.S. Fish and Wildlife Service. As part of the 1974 Endangered Species Act (50 CFR 17), several categories of federal status for plants and animals were created by the DOI, Fish and Wildlife Service. Plants and animals can be listed in the Federal Register as endangered or threatened, thereby receiving protection under federal law. It is illegal to pick, damage, or destroy any protected plants on property not owned by the individual, or to hunt, import, export, or possess protected animals. Further, federally assisted or sponsored projects that would affect protected species must be reviewed by DOI for a determination of impacts. Other categories exist for species that require further study before determining whether they are endangered or threatened.

State Legal Status—DEC. Under the New York State Environmental Conservation Law and its implementing regulations (6 NYCRR, Parts 193 and 182), NYSDEC maintains a list of plant and animal species that are considered rare, endangered, threatened, or of special concern. The classifications are slightly different for plants and animals—e.g., plants can be considered endangered, threatened, rare, or vulnerable, while animals can be endangered, threatened, or of special concern. These state designations have legal status, providing protection for plants and animals that are endangered, threatened or rare, although species considered to be vulnerable or of special concern have no legal protection. (Species determined to be of special concern are those that are candidates for listing as rare or endangered, but for which insufficient data exist for a final determination.) It is a violation to pick, damage, or destroy any protected plants on property not owned by the individual, or to apply defoliant or herbicides, or carry these plants away without the owner's consent. Animal species designated as endangered or threatened are protected from hunting, importing, exporting, or possession.

FLOODPLAIN

The drainage system of a land area is the method by which storm water is conveyed to a receiving water via the land's drainage system. An important component of this system is the floodplain, or the area low enough to hold flood waters during large storms. When the banks of rivers or streams overflow during a storm, the wide, flat floodplain spreads the water, reducing its velocity and force. The floodplain permits the water to flow more slowly to the stream or river and, in some cases, its vegetation removes pollutants. Thus, it is a very important element in protecting water resources.

Regulated floodplain areas have been defined and include areas that flood during storms that have a 1 percent chance of occurring in any given year (100-year storm). FEMA also maps the 500-year floodplains, but these are not regulated. Federal regulations require an analysis of impacts and options to avoid floodplain encroachment. FEMA has responsibility for mapping and regulating floodplain areas. Federal regulations stipulate that in the case of a "significant encroachment" on the floodplain by a proposed project, a finding of an "only practicable alternative" is required. While a project may encroach on the 100-year floodplain, this encroachment may not be significant. In addition to federal requirements, NYSDEC Environmental Conservation Law regulations (6 NYCRR Part 502) require state agencies contemplating projects in the floodplain to consider the effect of these actions both individually as well as cumulatively with other projects in the vicinity. In New York City, Local Law 33 of 1988 regulated building in the 100-year floodplain. In all cases, habitable structures must be flood-proofed or raised above the 100-year floodplain.

NAVIGABLE WATERS

Section 10 of the Rivers and Harbors Act of 1899 gives COE jurisdiction over any structure in navigable waters, while Section 9 requires that the Coast Guard issue permits for bridges over these same waters. Section 10 requires a permit for construction of structures on or affecting navigable waters of the United States. For the permit to be issued, the project must not obstruct or alter navigable waters, present a significant adverse effect on the aquatic environment, or result in violations of water quality criteria. In addition, the project must result in public good.

COASTAL ZONE

The Federal Coastal Zone Management Act (CZMA) of 1972, established to support and protect the distinctive character of the waterfront, set forth standard policies for reviewing proposed development projects along coastlines. NYSDOS administers the program at the state level and NYCDCP administers it in New York City. The program includes 44 statewide policies for waterfront protection and improvement and 12 policies specifically for New York City. The 56 policies address the following specific coastal issues:

- Public access;
- Recreation;
- Development;
- Flood and erosion hazards;
- Water resources;
- Fish and wildlife;
- Scenic quality;
- Cultural resources;
- Air quality;
- Energy; and
- Agriculture.

NYSDOS, in consultation with NYCDCP, will review the East Side Access (ESA) Project for consistency with the program. NYSDOS will review the consistency determination as required under the Coastal Zone Management Act regulations.

C. EXISTING CONDITIONS

WETLANDS

There are no freshwater wetlands located on or adjacent to any of the project sites, which currently provide habitats to those wildlife and plant species that have adapted to a highly disturbed habitat. Based on limited field surveys, reviews of aerial photographs, and federal and state wetland maps, no freshwater wetlands were identified in any of the study areas defined for the Preferred Alternative.

The Harlem River is designated by NYSDEC as a littoral zone of a tidal wetland (that portion of a tidal water that is shallow enough to let sunlight penetrate to the land on the bottom). The biological importance (i.e., the contribution to marine food production) of littoral zones varies greatly, although typically little vegetation grows in these zones in New York City because of the high turbidity of the waters. Highbridge Yard is the only project area whose location presents a potential for impacts to tidal wetlands or adjacent areas to occur, since the Harlem River is designated as littoral zone of a tidal wetland. An existing riprap wall running north and south separates the Harlem River boundary from Highbridge Yard. A site reconnaissance was conducted and the wall appears to be functional.

WATER QUALITY

The majority of each of the project sites are within developed areas. Water bodies located near one or more of the project sites include the East River (63rd Street tunnel, Sunnyside Yard, Yard A, Blissville Yard); Newtown Creek (Sunnyside Yard, Yard A, Blissville Yard, Maspeth Yard); Dutch Kills (Sunnyside Yard, Yard A, Blissville Yard); Maspeth Creek (Maspeth Yard); and the Harlem River (Highbridge Yard).

EAST RIVER

The completed 63rd Street tunnel lies beneath the East River just north of the Queensboro Bridge. The East River separates Manhattan from Queens, extending from the Upper New York Bay at the southern edge of Manhattan to the southern end of the Long Island Sound in northern Queens. Roosevelt Island divides the East River into the West Channel and East Channel. The East River is classified by NYSDEC as a Class I water. The best recreational usages of a Class I water, as determined by NYSDEC in accordance with the considerations prescribed by the Environmental Conservation Law, 6 NYCRR Part 701.10-710.14, are secondary contact recreation and fishing. Secondary contact recreation involves recreational activities where contact with the water is limited, such as boating. Class I waters are suitable for fish propagation and survival.

NEWTOWN AND MASPETH CREEKS

Newtown Creek is located east of the East River, and serves as the boundary between Queens and Brooklyn. Dutch Kills is a small branch of Newtown Creek which terminates approximately 1,000 feet south of Sunnyside Yard. Maspeth Creek is also a small branch of Newtown Creek, terminating approximately 1,000 feet southwest of Maspeth Yard. Newtown Creek, Dutch Kills, and Maspeth Creek are classified by NYSDEC as Class SD saline surface waters. The best usage of a Class SD water is fishing. It is suitable for fish survival but not fish propagation, and does not meet the requirements for contact recreation.

HARLEM RIVER

Highbridge Yard is situated on the east bank of the Harlem River, approximately a mile south of the George Washington Bridge. The Harlem River separates Manhattan from the Bronx. It extends from the Hudson River at the northern tip of Manhattan to where it meets the East River at the southern end of Wards Island. The Harlem River is classified by NYSDEC as a Class I saline surface water.

ECOLOGICALLY SENSITIVE AREAS

No significant or unique habitats were identified in any of the project areas during the request for information from the various agencies regulating critical habitats and endangered species, and none of the proposed project areas is on NYSDEC's Critical Environmental Areas list, last updated in June 1999. The project sites are not close to any of the 15 Significant Coastal Fish and Wildlife Habitats in New York City. To ensure that unregulated wetlands, ecologically sensitive areas, or critical environmental areas were not missed during the information search, a site visit to each project area was conducted.

SUNNYSIDE YARD AND ENVIRONS

The site is a 105-acre heavily trafficked yard in the Sunnyside neighborhood of Queens. Vegetation was limited to the Harold Interlocking and loop track areas of the yard (the perimeter of the site); however, the loop track area was not accessible for inspection at the time of the site visit. Less than 20 percent of the site was vegetated, and no vegetation was observed between the tracks. A number of wind-disseminated weeds and grasses were observed throughout the vegetated portions of the yard including Japanese knotweed, ragweed, goldenrod, white clover, crab grass, and goose grass. Woody species (8-40 feet high; 3-10 inches diameter at breast height, or dbh) observed in the Harold Interlocking area included black and water locusts, fire and black cherries, tree-of-heaven, cottonwood, smooth sumac, and birch, with an underbrush of vines such as poison ivy. Vegetation observed in the island between tracks in the western limits of Harold Interlocking included smooth sumac, bouncing bet, butter-and-eggs, common mullein, ragweed, Indian hemp, goldenrod, and pokeweed. Taller, more mature trees (20-60 feet high; 8-14 inches dbh) including scarlet oak, red maple, and white mulberry, were located in the area south of the tracks and north of Skillman Avenue. No wetland indicator species were observed during the site inspection. Soil borings taken from April to July 1999 indicate moist soils with groundwater at 7 to 12 feet below grade.

YARD A

Yard A is a 60-acre crescent-shaped rail yard located north-adjacent to Sunnyside Yard and south of Northern Boulevard. Approximately 70 percent of the yard was vegetated with mainly weeds and grasses between the tracks and in between ballast, including ragweed, Indian hemp, fleabane, bull thistle, horseweed, and foxtail grass. Larger trees (8-40 feet high; 3-12 inches dbh) were limited to a narrow strip along the western border of the rail yard adjacent to the industrial buildings and fenced areas. These species were primarily tree-of-heaven and cottonwood, with some oak and pawlonia. One potential wetland area was noted along the easternmost site boundary adjacent to the offsite industrial buildings. Phragmites and cottonwood predominated in this region. Soil borings installed in April 1999 showed this area to have a relatively shallow depth to groundwater, approximately 2 to 4 feet below grade. This pocket lowland was relatively small in size, approximately 3,000 to 5,000 square feet in area, and was not examined for hydric soils. This small, linear depression most likely receives surface runoff with a shallow groundwater table preventing total drainage, as occurs elsewhere onsite. Therefore, it has low value as a potential wetland resource and does not provide any sensitive habitat or ecological function.

BLISSVILLE YARD

Blissville Yard consists of an abandoned rail yard (approximately 6 acres) with several tracks in a serious state of disrepair running east-west the entire extent of the yard in western Queens. Like the other rail yards, the site is characterized by sandy soil and railroad ballast, and contains a mix of wind-disseminated weeds and grasses common to roadsides and waste places. Approximately 90 percent of the site is vegetated. More mature trees (15-40 feet in height) are found in the central portion of the site between the railroad tracks, including primarily tree-of-heaven, black cherry, and pawlonia, with some gray birch and black locust trees. Several planted poplar trees lined the southern portion of the site along the service road. No species indicative of wetlands were observed. The depth to groundwater was recorded by the USGS as less than 10 feet below grade.

MASPETH YARD

This site is a 9-acre crescent-shaped rail yard bounded to the north by two sets of Long Island Rail Road (LIRR) tracks along Rust Street, to the east by 57th Street, to the south by manufacturing buildings, and to the west by 49th Street, in Maspeth, Queens. Several railroad tracks run northwest to southeast the entire extent of the rail yard, and over 50 percent of the yard is vegetated. The site is characterized by sandy soil and railroad ballast, and vegetation is subjected to constant disturbance, as trains run through the yard daily. Wind-disseminated weeds and grasses have colonized areas between the tracks, including goldenrod, ragweed, red top, foxtail, and Timothy grass. The southern and eastern margins of the site are composed of woody vegetation, primarily tree-of-heaven, black cherry, and Japanese knotweed, and vines such as poison ivy. Other woody species include cottonwood, catalpa, and oak. More mature trees (20-60 feet high; 8-14 inches dbh), including maple and sycamore, are located just outside the study area, east-adjacent to the LIRR Montauk Division tracks. No wetland indicator species were observed. Monitoring well data collected in May 1999 indicated the depth to groundwater as 8 to 15 feet below grade, and hydrology at this site did not indicate wetlands.

FRESH POND YARD

The project site is a triangular parcel, approximately 2 acres, bounded on each side by a set of railroad tracks, located off Otto Road in Glendale, Queens. Most of the site consists of a gravel parking lot, with two trailers and several piles of construction materials. Scattered patches of grass and a few isolated weeds are located randomly throughout the gravel drive area. These include domestic grasses, dandelion, plantain, butter-and-eggs, and Queen Anne's lace. One scarlet oak tree was located in front of the trailer on-site, and an area of weeds (less than 10 percent of the site) was located behind the trailer, between the piles of construction materials, and consisted mostly of ragweed and goldenrod. No wetland species were observed during the site inspection. The site is characterized by dry, sandy soil and gravel. The depth to groundwater was recorded by the USGS as 10 to 20 feet below grade, and the hydrology at the site did not indicated wetlands.

HIGHBRIDGE YARD

Highbridge Yard is a 17.6-acre crescent-shaped rail yard, located between the Major Deegan Expressway and the Harlem River in the Bronx. The site is mainly occupied by several tracks, including mainline tracks for Metro-North Railroad's (MNR's) Hudson Line, and a paved road. Approximately 30 percent of the site is vegetated. The site contains a mix of herbaceous and early successional woody vegetation throughout, with more mature trees (20-60 feet in height; 8-14 inches dbh) along the Harlem River. Along the shore, the width of the more mature woody vegetation type (mid-successional hardwoods) varies from being quite narrow to as wide as 75 feet or more. It is primarily composed of black cherry, fire cherry, tree-of-heaven, cottonwood, black locust, and staghorn sumac. The remainder of the site, including all the area between the non-active rails, is comprised of wind-disseminated weeds and grasses typical of roadsides and waste places, including ragweed, goldenrod, milkweed, dandelion, and foxtail and redtop grasses. The river bank is fully riprapped and exhibited no intertidal marsh vegetation (*Spartina* sp.) at the time of the site visit.

The area east of the commuter lines, in the proposed employee parking area, was vegetated with mostly ragweed and a few smaller trees (10-20 feet in height; 3-8 inches dbh) including tree-of-heaven, fire cherry, and white and paper mulberries. One potential wetland area was noted along the easternmost site boundary, along the wall of the Major Deegan Expressway. Phragmites predominated in this small region, which was approximately 1,000 to 3,000 square feet in area and was not examined for hydric soils. This small, linear depression most likely receives surface runoff from the Major Deegan Expressway, with a shallow groundwater table preventing total drainage, as occurs elsewhere onsite. It has low value as a potential wetland resource and does not provide any sensitive habitat or ecological function.

Soil borings installed at Highbridge Yard in April 1999, indicate groundwater 6 to 8 feet below grade.

ENDANGERED, THREATENED, OR SPECIAL CONCERN SPECIES

NYSDEC's Division of Fish and Wildlife and New York NHP, the National Marine Fisheries Service, and FWS were each contacted for information concerning endangered and threatened species. NHP reported a sighting of a peregrine falcon (Falco peregrinus) at the Met Life Building at 200 Park Avenue in a correspondence dated April 26, 1999. The bird is a listed endangered species with both federal and state regulatory agencies, and was last sighted at the building in 1998. FWS also reported the occurrence of the peregrine falcon in the vicinity of the Manhattan portion of the project area, the Highbridge Yard Area, and the Sunnyside Yard/Yard A Area in a May 13, 1999 correspondence. The peregrine falcon is often seen nesting or perched on high structures in New York City. The ESA Project would not affect any of these locations.

NHP identified one vascular plant species, the pink wild bean (*Strophostyles umbellata*), classified as unprotected, that has been historically sited in the vicinity of the Fresh Pond Area as far back as 1911. A classification of unprotected does not give the species federal protection, but according to NYSDEC regulations, it may be given special consideration prior to disturbance. This plant was reported in the Glendale neighborhood of Queens, but probably does not currently occur in the project area, because the habitat for the plant has been removed due to urbanization.

FLOODPLAIN

According to FEMA maps, the only regulatory floodway in New York City is the Bronx River, which is far from each of the project areas. Although portions of the Sunnyside Yard/Yard A area, Blissville Yard, and Highbridge Yard are situated within the 100- and 500-year floodplains (see Figures 15-1 through 15-3). Any habitable structures would be located outside of the 100-year floodplain, flood-proofed, or raised above the 100-year floodplain.

NAVIGABLE WATERS

Most of the project areas are adjacent to or in the vicinity of bodies of water that have been mapped by NOAA as navigable waters. However, the only construction associated with the ESA Project involving a navigable body of water is within the existing tunnel crossing the East River at 63rd Street, where track work, signals, and other systems elements would be built. The ventilation and substation facilities associated with the 63rd Street Tunnel would be done on Roosevelt Island and in Manhattan and Queens and would not involve any construction within the waterway itself.

COASTAL ZONE

According to NYCDCP's Coastal Zone maps, Blissville and Highbridge Yards are located entirely within the boundaries of the Coastal Zone and the majority of Maspeth Yard is located within the boundaries of the Coastal Zone. The project is examined with respect to each of the relevant coastal zone policies in this chapter.

D. FUTURE CONDITIONS COMMON TO ALL ALTERNATIVES

Future water quality conditions of the study area waters are expected to improve as a result of pollutant load reductions and the resulting water quality improvements. Current and planned activities include:

- Combined Sewer Overflow Abatement—NYCDEP anticipates that as many as 12 retention facilities will be required citywide. The program currently consists of eight facility planning projects: four areawide projects (East River, Jamaica Bay, Inner Harbor, and Outer Harbor) and four tributary projects (Flushing Bay, Paerdegat Basin, Newtown Creek, and Jamaica Tributaries). Implementation of this program is expected to continue through at least 2006.
- New York Harbor Estuary Program and Bight* Restoration Plan—This plan concentrates on water pollution problems within the bight, but targets management strategies in New York Harbor and the surrounding coastal region. The collaborative framework of the Harbor Estuary Program/Bight Restoration Plan provides a unique opportunity to characterize estuarine and ocean-related problems, develop solutions, and incorporate these findings into long-range implementation strategies, with recommendations for protecting the New York Harbor and the New York Bight.
- Long Island Sound Comprehensive Conservation and Management Plan—This plan focuses on relieving oxygen-deficient water—also known as hypoxia—conditions in Western Long

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* A bight is defined as a bend in the coast that forms an open bay, in this case, the New York Bight, which extends from Cape May, New Jersey, to Montauk Point, New York.

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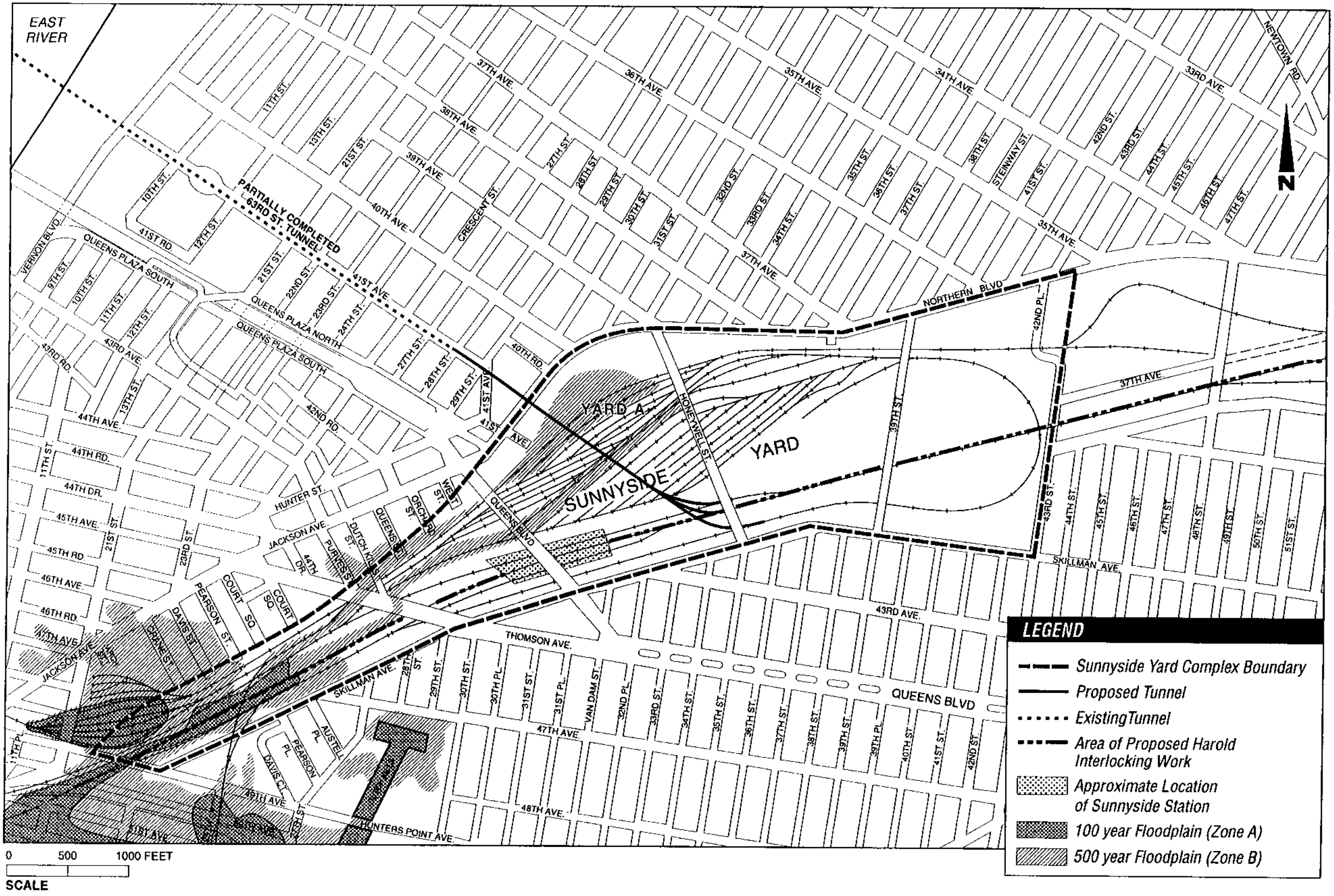

LEGEND

- Sunnyside Yard Complex Boundary
- Proposed Tunnel
- Existing Tunnel
- Area of Proposed Harold Interlocking Work
- ▨ Approximate Location of Sunnyside Station
- ▨ 100 year Floodplain (Zone A)
- ▨ 500 year Floodplain (Zone B)

Figure 15-1

Floodplain: Sunnyside Yard and Yard A

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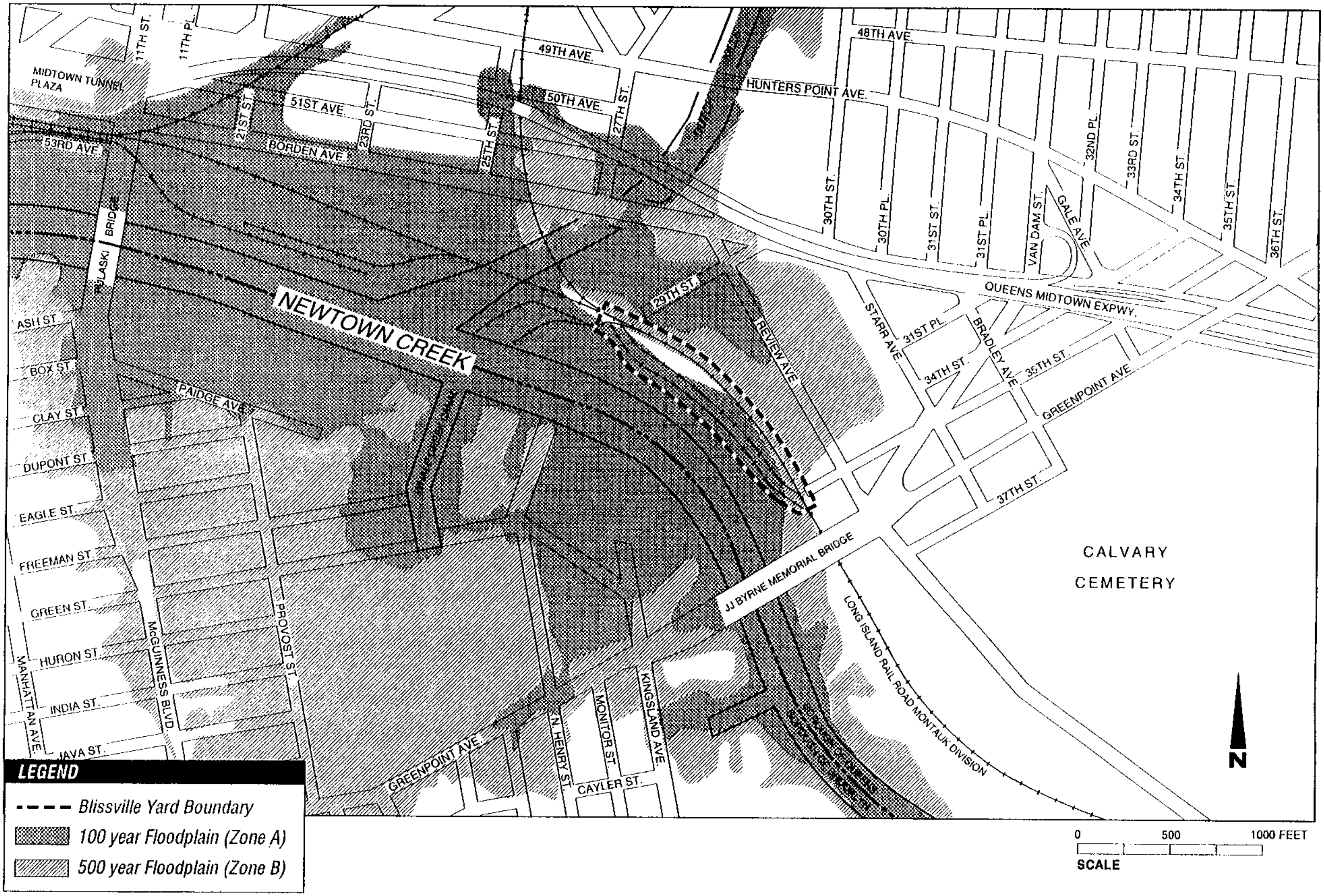

MTA / LIRR

East Side Access

Figure 15-2

Floodplain: Blissville Yard

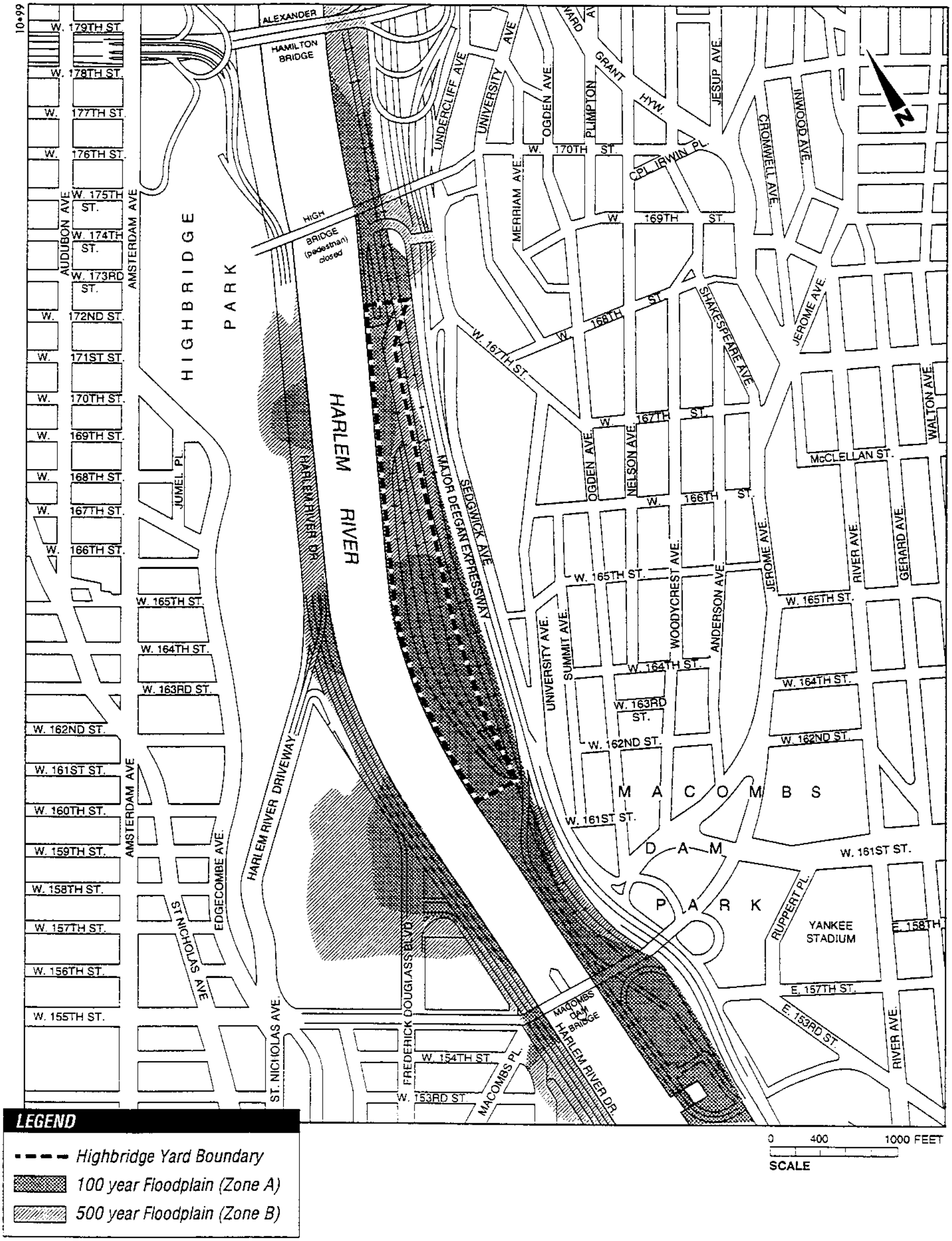

Figure 15-3

Floodplain: Highbridge Yard

Island Sound as its highest priority as well as on nitrogen reduction, but also addresses other water quality problems, such as toxics, pathogens, floatables, and the effects on living marine resources within the Sound.

- Continued implementation and operation of the citywide floatables program, industrial pretreatment, and nutrient reduction programs.
- Development of a comprehensive floatables plan.
- Toxics reduction.

In addition, waters within the study area could improve as a result of similar efforts in the States of New Jersey and Connecticut as well as in other New York State municipalities that discharge to the Hudson River and western Long Island Sound.

E. PROBABLE IMPACTS OF THE PROJECT ALTERNATIVES

NO ACTION ALTERNATIVE

The No Action Alternative would have no direct or indirect adverse effects on natural resources in the project's study areas. As discussed above under "Future Conditions Common to All Alternatives," however, the City of New York is in the process of implementing several projects that are expected to improve future water quality in the waters surrounding the city. The indirect benefits of the Preferred Alternative on regional air quality and their related effect on the study area's natural resources would not occur. Specifically, as discussed in Chapter 10, "Air Quality," the Preferred Alternative would reduce vehicular emissions throughout Long Island and parts of New York City. While it is not possible to quantify the beneficial effects of the reduced deposition of certain airborne pollutants (acid aerosols and ozone) on the study area's natural resources, under the No Action Alternative, this benefit would not occur.

In addition, as discussed below, the No Action Alternative would not revitalize the existing underutilized rail yards that are within the city's coastal zone and could become an integral part of the region's transportation infrastructure.

TRANSPORTATION SYSTEMS MANAGEMENT (TSM) ALTERNATIVE

As described in Chapter 2, "Project Alternatives," the TSM Alternative consists of three components: increasing LIRR train length, increasing train service to the Long Island City and Hunterspoint Avenue train stations, and constructing a contraflow bus/taxi lane on the Long Island Expressway in Queens.

The only potential impact to natural resources would be related to the possible secondary elements of the increased train service to Long Island City. If this increase in train service causes a demand for ferry service from Long Island City to East 34th Street to exceed the capacity of the existing ferry slip in Queens (currently sufficient to handle a 250-passenger ferry), an additional ferry slip in Long Island City might be constructed. Should such a slip be constructed, permits from appropriate agencies such as the NYSDEC and the COE would be obtained to ensure that the construction of such a slip would not have adverse impacts on aquatic resources.

PREFERRED ALTERNATIVE

WETLANDS

As discussed above under "Existing Conditions," Highbridge Yard lies along the Harlem River, which is a tidal wetland. It is separated from the river by a riprap wall, which effectively and legally severs its relationship to the wetland. However, if it is determined that sections of the wall are not functional at the time of any construction activities, the wall must be repaired in order to eliminate setback requirements. If the structure is not deemed functional at the time of construction, the adjacent area includes the land up to 150 feet landward of the tidal wetland boundary (the shoreline of the Harlem River) and a permit would be required for construction activities.

Very small areas in both Highbridge Yard and Yard A contain phragmites, vegetation typically associated with wetland areas. These localized areas, however, are both depressed areas on the two respective sites and, as discussed previously, are not valuable wetland resources. They are not mapped as NYSDEC-regulated wetlands, and any work in them would not require a NYSDEC permit. These depression are less than ⅓ acre and work in them would be allowed under COE's nationwide permit (NWP) program. Activities allowed under the NWP program have been found not to have the potential for an adverse environmental impact.

WATER QUALITY

Impacts to water quality of a surface water body could happen in the following cases: (1) if the project substantially alters the quality and quantity of storm water runoff; (2) if construction involves changes to the bulkhead or other parts of the water's edge; or (3) if activities during construction increase silt and other contaminants in the water body. Stormwater management plans would be developed for construction activities taking place at each of the project areas, impacts to the water quality of Newtown Creek, Dutch Kills, and Maspeth Creek would not be expected to occur since these water bodies are not adjacent to the proposed construction activities.

Highbridge Yard

The preferred alternative could potentially introduce new sources of pollution during its operation. Controls instituted during construction at Highbridge Yard would prevent adverse effects on water quality in the Harlem River (see Chapter 17, "Construction and Construction Impacts," for further discussion). Issues related to industrial discharge stormwater runoff, and releases of sediment, silt, and other contaminants during construction are discussed below.

Industrial Discharge. Proposed construction at Highbridge Yard includes the development of six storage and servicing tracks, one locomotive inspection pit, two runaround tracks, a two-track car appearance facility, an employee access platform, and an employee parking lot. Development of additional facilities, including a car wash and five diesel consist tracks, may occur as part of related MNR construction. These new facilities could introduce various materials, such as cleaning fluid or solvents, to the runoff from the site.

An industrial discharge evaluation would be made for the various types of waste streams generated at the Highbridge Yard. These types of discharges may include discharges from storage and maintenance facilities, train car wash systems, train car sanitary waste removal operations, fueling pad area storm water and other industrial-related discharges. New York City Administrative Code 15 RCNY 19, Use of Public Sewers, Sections 19-01 through 10-9-04 establishes industrial discharge limits for several toxic substances. These limits are based on federal regulations governing the Industrial Pretreatment Program (IPP) which is locally administered by NYCDEP. Pre-treatment systems would be designed and specified to meet industrial discharge limits as administered by NYCDEP. Meeting IPP limits would ensure that the project's discharges to the sewer system would not have an adverse impact on water quality.

Stormwater Runoff. Changes to the current patterns of stormwater drainage and runoff are expected as a result of the construction of additional buildings and an increase in the impervious (paved) area on the site. The storm water design would properly convey storm water from roads and walkways while minimizing the volume of water that has to be collected, conveyed and discharged. The runoff from paved parking areas and service aisles, due to the volume of sediment and sand present at these locations, would be collected and piped through a gross particle separator (GPS) before discharging into a storm drain trunk line feeding to a stormwater oil/waste separator.

The storm drain system would be designed for a 10-year storm event with the full yard development. Roof drains from all buildings would also be connected to the storm drainage system. The storm drain system would be designed as a sanitary system with gasketed pipe joints and neoprene boots at structures to prevent infiltration of groundwater into the storm drainage system.

The existing storm drainage systems at the yard would be evaluated for condition, regulatory compliance, and capacity. The systems would be rehabilitated, replaced, or supplemented with new systems for the new yard development. The storage yards would have underdrains installed to keep the sub-ballast and ballast from becoming saturated.

A new application for or modifications to an existing (if applicable) State Pollutant Discharge Elimination System (SPDES) stormwater permit for the Highbridge Yard would be completed based on the final design and NYSDEC regulations.

Increase of Silt and Other Contaminants During Construction. Controls would be instituted during construction to prevent soil erosion and runoff of sediment, silt, and other contaminants into the river. Controls include construction of silt fences and covers for exposed dirt and excavated areas to prevent soil erosion and an increased load of sediment, silt, and other contaminants to the Harlem River.

Stormwater drains directly connected to the Harlem River would drain to the river during a storm event. Drains connected to the combined sewer system would be discharge runoff to city sewers. In either scenario, silt and sediment caused by construction activities would be removed from storm water prior to discharge.

Other Project Areas

For the remaining five project areas, water quality issues are primarily related to the quality of water discharged to the city sewers as a result of dewatering activities. While stormwater management plans would be developed for all construction activities proposed in each of the project areas, impacts to the water quality of the surface water bodies in the vicinities of these areas (Newtown Creek, Dutch Kills, and Maspeth Creek) are not likely since runoff would not directly enter these water bodies. As at Highbridge Yard, soil erosion prevention measures and settling basins would remove silt and sediment from the collected storm water before it is discharged to the city sewers.

At the Sunnyside Yard/Yard A area, some dewatering would take place in association with the proposed construction and tunneling activities. As discussed in Chapter 14, "Contaminated Materials," the groundwater is generally not contaminated. Groundwater would be discharged to the sewers following treatment on-site by settling basins or flocculents.

Maintenance facilities are proposed at Yard A and Fresh Pond Yard; this could introduce detergents, oil, and solvents to the runoff from the site. As at Highbridge Yard, a pre-treatment system would be constructed on the site so that process discharges would not have an adverse impact on water quality.

FLOODPLAIN

Blissville Yard and the majority of Highbridge Yard are situated within the 100-year floodplain. However, neither of these are located within a floodway (as all flooding in this area is tidally driven, and not caused by riverine systems), and most of the construction activities involve rehabilitating an existing rail yard. The small number of additional structures to be built within these areas would not therefore be considered a significant encroachment and result in any increases in flood levels in surrounding areas.

Portions of the western end of Sunnyside Yard, in the location of the tunnel portals for the four East River tunnels to Penn Station, are located within the 100-year floodplain. However, the proposed construction in this area involves only minor improvements to an existing rail right-of-way. The area is already developed, so the project is not eliminating primary beneficial floodplain characteristics that exist now.

The improvements to the existing rail yards would not support incompatible floodplain development because the development already exists. Any construction that would take place within the 100-year floodplain would not increase flooding risks, impact on natural and beneficial floodplain values, or support probable incompatible floodplain development. Therefore the Preferred Alternative would not constitute a floodplain encroachment.

COASTAL ZONE

New York City's coastal zone management program, the Waterfront Revitalization Program (WRP), includes 44 statewide policies for waterfront protection and improvement (Policies 1 through 44) and 12 policies specifically drafted for and by the City of New York (Policies A through L). Each applicable policy is presented below, followed by a discussion of the Preferred Alternative's consistency with the policy.

Policy 1: Restore, revitalize, and redevelop deteriorated and underutilized waterfront areas for commercial, industrial, cultural, recreational, and other compatible uses.

> By rehabilitating and/or reconstructing the Highbridge, Blissville, and Maspeth rail yards, the project would be consistent with this policy. The project would restore these once active yards and put them to use as part of the region's transportation network.

Policy 2: Facilitate the siting of water dependent uses and facilities on or adjacent to coastal waters.

> By restoring once-active rail yards into the regional transportation network, the project would provide possible future opportunities for waterborne freight-to-rail transport. This would be consistent with siting water-dependent uses adjacent to coastal waters.

Policy 3: Promote the development and use of the state's major ports as centers of commerce and industry, emphasizing the siting, within port areas of land use and development that is necessary to, or in support of, the waterborne transportation of cargo and people. The state's major ports are the ports of Albany, Buffalo, New York, Ogdensburg, and Oswego.

> As discussed above, the proposed project would foster the transportation of goods by restoring the Blissville or Maspeth rail yard to New York & Atlantic Railway's freight operations. The potential for intermodal movement of goods would be increased.

Policy 8: Protect fish and wildlife resources in the coastal area from the introduction of hazardous wastes and other pollutants that bioaccumulate in the food chain or cause significant sublethal or lethal effects on those resources.

> As discussed in Chapter 14, "Contaminated Materials," the proposed project would be constructed to avoid discharging of hazardous materials into the city's coastal waters. A subsurface investigation of Highbridge Yard has been conducted as part of this EIS and mitigating measures to prevent the discharge of toxic materials into the Harlem River is discussed in Chapter 14.

Policy 11: Buildings and other structures will be sited in the coastal area so as to minimize damage to property and the endangering of human lives caused by flooding and erosion.

> The project locations are not located within the city-designated coastal erosion hazard area, the city's Atlantic Ocean shoreline area, which is subject to flooding and erosion.

Policy 14: Activities and development including the construction or reconstruction of erosion protection structures, shall be undertaken so that there will be no measurable increase in erosion or flooding at the site of such activities or development at other locations.

> The proposed action would not create a measurable increase in the risk of erosion or flooding at the construction sites or at other locations, as erosion control measures would be used. The risk of flooding also would not increase.

Policy 18: To safeguard the vital interests of the State of New York and of its citizens in the waters and other valuable resources of the state's coastal area, all practicable steps shall be taken to ensure that such interests are accorded full consideration in the deliberations, decisions and actions of state and federal bodies with authority over those waters and resources.

> Coastal considerations are part of the NEPA review of the project. The compatibility of the project's program and design with the policies of the WRP, which reflect the vital interests of the state and its citizens in this matter, is addressed in this EIS and will be considered during public review and final decision-making.

Policy 21: Water-dependent and water-enhanced recreation will be encouraged and facilitated, and will be given priority over non-water-related uses along the coast.

> The proposed project seeks to rehabilitate several once-active rail yards that are located in the city's coastal zone. As such, these sites have the potential for water-enhanced activity, and due to the industrial nature of the surrounding land uses, these rail yards would not be appropriate locations for recreational use of the waterfront.

Policy 23: Protect, enhance, and restore structures, districts, areas, or sites that are of significance in the history, architecture, archeology, or culture of the state, its communities, or the nation.

As discussed in Chapter 8, "Archaeological Resources," the Preferred Alternative has the potential to cause an impact to archaeological resources. To prevent adverse impacts, soil borings and subsequent analysis would be undertaken and coordinated with the State Historic Preservation Office (SHPO) and New York City Landmarks Preservation Commission (LPC) before construction work commences at the location that could potentially contain archaeological resources.

Policy 33: Best management practices will be used to ensure the control of stormwater runoff and combined sewer overflows draining into coastal waters.

At all sites, a rehabilitated stormwater system will be included as part of the project that will conform to Best Management Practices.

Policy 36: Activities related to the shipment and storage of petroleum and other hazardous materials will be conducted in a manner that will prevent or at least minimize spills into coastal waters: all practicable efforts will be undertaken to expedite the cleanup of such discharges; and restitution for damages will be required when these spills occur.

The project alternatives would not involve activities directly related to the shipment and storage of petroleum (with the exception of a fueling system for diesel locomotives at Highbridge) and other hazardous materials. The facility would be designed in accordance with all applicable regulations to prevent discharge to the State's coastal waters. However, during construction, the removal and disposal of any hazardous materials would be performed in conformance with all applicable local, state, and federal requirements.

Policy 37: Best management practices will be utilized to minimize the non-point discharge of excess nutrients, organics, and eroded soils into coastal waters.

During construction, erosion-control measures would be used where appropriate to minimize sedimentation into coastal waters.

New York City Policy K: Curtail illegal dumping throughout the coastal zone and restore areas scarred by this practice.

By reclaiming several neglected rail yards, the proposed project would remove the debris on several sites and preclude future dumping by instituting an active presence at this location.

Policy 41: Land use or development in the coastal area will not cause national or state air quality standards to be violated.

As discussed in Chapter 10, "Air Quality," the project would not cause any national or state air quality standards to be violated. In fact, by reducing automobile travel in the region, the project would contribute to a substantial reduction in vehicular pollutant emissions.

Policy 44: Preserve and protect tidal and freshwater wetlands and preserve the benefits derived from these areas.

As discussed previously in this chapter, the Harlem River has been mapped by NYSDEC as a littoral zone of a tidal wetland. Due to the existing riprap bulkhead along the Highbridge rail yard, no significant impacts to the littoral zone would occur due to construction of the Preferred Alternative.

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Chapter 16: Safety and Security

A. INTRODUCTION

This chapter identifies safety and security considerations related to the design and operation of the East Side Access Project's Preferred Alternative, including new tunnels, stations, and redeveloped yards. In addition, it considers the effects of an increased number of trains traversing at-grade crossings throughout the Long Island Rail Road (LIRR) system, as a result of the Preferred Alternative. These effects include the potential for an increased number of train/motor vehicle collisions and train/pedestrian collisions. Construction-related safety and security considerations are described in Chapter 17, "Construction and Construction Impacts."

A System Safety and Reliability Assurance program has been developed for the Preferred Alternative, framed on principles established by the American Public Transit Association for construction of new underground systems. The objective of the program is to define key requirements and constraints to facilitate a structured, effective, and efficient safety program for the operation of the proposed new service into Grand Central Terminal (GCT).

The program includes the following:

- Definition of roles and responsibilities for an ongoing safety management organization.
- Identification, assessment, documentation, and management of safety hazards.
- Fire/life safety protection policy and criteria.
- Methods to ensure that local, state, and federal standards and regulations are met and that adequate documentation is readily available for approval by regulatory bodies, as required.
- Process and criteria for management of safety issues through specifications, design, construction, testing, and verification.
- Procedures to ensure required level of safety for the vehicle and wayside systems and for each of their subsystems.
- Procedures to ensure proper integration of safety documentation into the overall system.
- Procedures to guide the oversight of the vehicle procurement to ensure that applicable standards for fire/smoke retardation and egress are provided and that hazards are practically mitigated.
- Procedures to guide the oversight of the systems design efforts to ensure that applicable standards for annunciation, detection, and automatic system response to life safety threats are provided and the overall system reliability meets program goals.
- Guidelines for developing a safety certification program that will verify the inclusion of safety-related items in the design, testing, and operation of the system and set the framework for the successful safety management system in revenue operations.

Specific measures that would be implemented into the design of the tunnels, tracks, yards, and stations associated with the East Side Access Project are discussed below.

B. TUNNEL SAFETY MEASURES

The project's new tunnels would incorporate the safety and reliability policies of the LIRR and the fire/life safety codes and standards of the State of New York and the National Fire Protection Association (NFPA) 130, 72, 101, 241. The safety measures expected to be provided in the tunnels are typical for new underground rail systems in North America and would include seven primary features, discussed below. Fire/life safety, security and ventilation systems would be monitored and controlled from an Operations and Control Center as defined in NFPA 130.

FIRE DETECTION AND ALARM

A fire detection and alarm system would be provided to automatically detect a fire/smoke incident and notify the authority having jurisdiction and the planned control center. The proper actions would then be undertaken by control center staff to ventilate the vicinity of the incident and to provide a means of egress as smoke-free as possible for passengers and access for emergency services.

EMERGENCY VENTILATION FOR SMOKE CONTROL

Emergency ventilation systems would be provided to remove smoke from each tunnel area quickly and efficiently. The emergency ventilation systems would be controlled from the planned control center with alternate means provided from a local Fam Management Panel (FMP) accessible by the fire services. These systems would be powered from both commercial and local emergency sources to ensure complete availability when needed.

EMERGENCY LIGHTING

Emergency lighting would be provided in the tunnels to maintain a minimum level of illumination along the path of exit from an incident area. This emergency lighting would be backed up by an emergency power source to ensure complete availability when needed.

EMERGENCY EXITS

Emergency exits would be provided to allow rapid egress to the surface from any point in the tunnels. The emergency exits would be illuminated and ventilated to provide a means of egress as smoke-free as possible from the tunnels. In addition, signage directing passengers and crews to the appropriate emergency exits would be installed.

FIRE STANDPIPE AND HOSE SYSTEMS

Tunnel fire standpipe systems would be provided per NFPA 130, so as to provide water supply throughout the tunnels, if needed by the fire department. Temporary fire standpipe systems would be provided in tunnels under construction for fire department use, in the case of a fire emergency.

EMERGENCY COMMUNICATIONS

Developed in consultation with local police and fire services, emergency telephone networks and radio communications would be provided throughout the tunnels and stations. In this manner, all emergency services personnel responding to an incident in the tunnels would have reliable and independent means of communicating with their command centers and supervisory staff.

BLUE LIGHT STATIONS

At locations along the new tunnel tracks, "blue light" stations would be provided. These are stations that would provide authorized personnel with the capability to communicate with the Operations and Control Center, and to disconnect traction (third-rail) power, so that, in the event of an emergency, passengers and crew may exit the trainway in safety.

C. YARD SAFETY MEASURES

The greatest level of public safety can be provided by controlling and restricting public access to railroad yards. The following measures could potentially be taken at each yard for public safety and security reasons:

At Highbridge Yard, a security fence along the perimeter of the facility, closed circuit television (CCTV), and a low-level security lighting system could help secure the yard during non-operating hours.

Yard A, which would include vehicle storage operations and a maintenance shop, would be a 24-hour operation. It is currently grade-separated from all surrounding public areas. A low-level security lighting system could be provided for areas of the yard that would not be active at night. A security patrol may be required during nighttime hours.

Fresh Pond Yard and Blissville or Maspeth Yard (which would be operated by New York & Atlantic Railway) would be 24-hour operations and would not require a high level of security. Fencing around the perimeter of the yards could be provided as needed, but security lighting would probably not be provided.

D. SUNNYSIDE STATION SAFETY MEASURES

Since 90 percent of the passengers alighting and boarding trains at Sunnyside station would arrive and depart by foot, safety and security considerations at the new station include areas on sidewalks and streets providing access to the station, in addition to areas within the station itself.

STATION SAFETY

Sunnyside station is being designed in accordance with LIRR Station Design Guidelines, the requirements of the Americans with Disabilities Act (ADA), and applicable fire and safety codes. All public station areas, including the station headhouse, pedestrian walkways, platforms, elevators, ticket windows and public restrooms, would be able to accommodate customers in wheelchairs and those who are visually impaired. Emergency exits, sprinklers, and fire extinguishers would be provided where required by the applicable codes. A ventilation system for the station would cool the inside of the station during the summer, and provide adequate airflow throughout the year.

STATION SECURITY

Sunnyside station would be designed to minimize areas of personal isolation and to promote a secure environment. The following concepts would be applied:

- A design that provides for a phased closure of station spaces, correlating to time of day and service needs. Station access points would be limited and controlled to facilitate clustering of customers for security.
- The internal passageways would enable LIRR customers to circulate between the station headhouse/mezzanine and the three platforms without having to traverse Skillman Avenue or Queens Boulevard.
- The station would be configured to promote visibility from the street and throughout the station.
- Clear sightlines and open spaces throughout the station would be provided. Hiding spaces and blind corners, which tend to encourage loitering and other miscreant activities, would be avoided.
- Materials that are vandal-resistant and that wear well would be used to resist damage and promote a sense of order throughout the station. A poorly maintained station signifies disarray, which could lead to negative customer perceptions of safety.
- Lighting would be provided to serve as a source of illumination and architectural treatment, and to promote a sense of personal safety.

TRAFFIC AND PEDESTRIAN ACCESS

The designated vehicular drop-off and pick-up area along the north sidewalk of Skillman Avenue (approximately 150 feet west of the Queens Boulevard and Skillman Avenue intersection) would deliberately be located away from the intersection to maintain adequate traffic flows on the heavily utilized Queens Boulevard bridge and to avoid the congested intersection of Queens Boulevard and Skillman Avenue. The jersey barrier that is to be constructed by the New York City Department of Transportation (NYCDOT) to prevent jaywalking on the bridge would also effectively prevent pick-ups and drop-offs at the Sunnyside station headhouse, ensuring that cars do not block active traffic lanes.

In conjunction with NYCDOT, the Queens Boulevard bridge sidewalk fencing, which is currently a combination of a sheet metal wall and low railing (and which currently provides little visibility down to the tracks below), would be replaced by a new artistically designed open fence to promote visibility and security between the street and the proposed station. It would also create a sense of pedestrian linkage between the Sunnyside station and the Queens Plaza subway station and linkage to sites of potential development to the north and west of Queens Plaza.

The design of the fence and pedestrian walkway would accommodate the concerns of involved parties, such as LIRR, Amtrak, NYCDOT, the New York City Department of City Planning, and others involved with Long Island City commercial development initiatives. Coordinated design efforts are under way and are expected to continue during preliminary and final design of the project.

E. GRAND CENTRAL TERMINAL SAFETY MEASURES

MEZZANINE SAFETY AND SECURITY

As at the new Sunnyside Station, new concourse and mezzanine areas in GCT would be ADA-compliant and accessible to the visually impaired. While new concourse and mezzanine spaces within GCT would most likely be open approximately 20 hours per day, from 6:00 AM to 2:00 AM, the design of the terminal would not preclude a 24-hour-a-day operation. Many of the same safety concepts as those applied at the new Sunnyside Station—clear sight lines, no blind corners, vandal-resistant materials, access control, intrusion detection, CCTV—would be incorporated into new spaces in GCT.

PLATFORM SAFETY AND SECURITY

All public areas in both Option 1 and Option 2 would be designed to comply with applicable NFPA-130 fire safety codes. These areas would include platform areas, which would comply with three relevant NFPA-130 requirements: evacuation time, evacuation distance, and exit width. Sufficient vertical circulation would be provided from all platforms to remove all passengers from platforms within four minutes and to a point of safety within six minutes in the event of an emergency; the maximum travel distance to an exit from any point on the platform would be no greater than 300 feet; and exits would be designed to comply with NFPA-130 standards for calculating minimum exit widths. These compliance measures would also apply to Option 2, where the new LIRR platforms would be located approximately 75 feet beneath the new LIRR mezzanine.

F. AT-GRADE CROSSING SAFETY MEASURES

The LIRR system currently has 302 at-grade crossings (299 for motor vehicles and 3 for pedestrians only), located on most segments throughout the system. All 302 crossings are equipped with active warning devices consisting of gates, lights, and bells. The warning devices are maintained in a state of good repair.

Areas where safety has been a particular concern because of trains moving at high speeds and the prevalence of at-grade crossings, some of which are heavily traversed by motor vehicles, include the following:

- The Main Line (between Jamaica and Hicksville) where there are eight at-grade crossings for motor vehicles and one pedestrian crossing;
- The Ronkonkoma Branch (between Hicksville and Ronkonkoma stations) where there are 27 at-grade crossings;
- The Port Jefferson Branch (between Hicksville and Port Jefferson), where there are 33 at-grade crossings; and
- The Port Washington Branch, where there is one at-grade crossing near Little Neck station.

There are no at-grade crossings between Penn Station and Jamaica or on the Babylon Branch between Jamaica and Babylon stations.

The New York State Department of Transportation (NYSDOT) has plans to eliminate all eight motor vehicle at-grade crossings on the Main Line by the year 2014, simultaneous to the addition of the third track under Main Line Third Track Project (this is described in section E of Chapter 1, "Project Purpose and Need," under "Other MTA Projects"). Three crossings between Queens Village and Mineola will be eliminated by 2009 and the remaining five, between Mineola and Hicksville, will be eliminated by 2014.

As a result of the Preferred Alternative, train passbys would increase by up to 65 percent on most branches during peak hours. The number of trains traversing at-grade crossings operating in both directions during the peak hour would increase as follows:

- From 25 to 42 on the Main Line (an increase of 17);
- From 5 to 8 on the Ronkonkoma Branch (an increase of 3);
- From 3 to 4 on the Port Jefferson Branch (an increase of 1); and
- From 14 to 17 on the Port Washington Branch (an increase of 3).

The number of train/motor vehicle or train/pedestrian conflicts at-grade crossings is not expected to increase in direct proportion to the increase in the number of train passbys. Since the adjacent communities are accustomed to living near an active railroad, and the locations of concern have relatively few train passbys either with or without the project, a significant increase in the number of accidents is not anticipated. Furthermore, the Preferred Alternative would result in fewer car accidents overall as daily vehicle miles traveled would be reduced by approximately 400,000.

Nevertheless, LIRR has the means of addressing potential increases in accidents near at-grade crossings through its TRACKS (Together Railroads and Communities Keeping Safe) System Safety Program. TRACKS is dedicated to addressing safety issues through civic groups, professional drivers, senior citizens, posters, schools, and community groups. In conjunction with Suffolk County Drug Abuse Resistance Education (DARE), Operation Lifesaver, and other partners, the program educates the public on the dangers of trespassing on railroad property and around the third rail, driving or walking around lowered gate arms, and not exercising proper caution at stations when boarding or leaving a train. Since the program's implementation more than two decades ago, the number of safety incidents near at-grade crossings has declined considerably.

Due to the complexity and geographical layout of the LIRR, many factors, which differ by location, affect safe crossings of railroad tracks. When identifying areas involving high incidents of accidents or trespass, the LIRR takes action to improve conditions and prevent future incidents. The TRACKS System Safety Program is one component of the railroad's efforts. It strives to reach every educational facility within the particular area for the purposes of educating youth and building awareness about the dangers of railroad tracks and crossings. The TRACKS program, along with the cooperative efforts of the Police Department and the Right-of-Way Task Force, has been successful in the past at preventing accidents in targeted areas. ❖

Chapter 17: Construction and Construction Impacts

A. INTRODUCTION

This chapter describes the activities required for construction of the project alternatives, described in Chapter 2, "Project Alternatives." It then considers the environmental impacts that may result from that construction and any required mitigation measures.

B. DESCRIPTION OF CONSTRUCTION ACTIVITIES

NO ACTION ALTERNATIVE

Since the No Action Alternative would not create new facilities or services other than those planned to occur without East Side Access, it also would not require construction activities.

TSM ALTERNATIVE

PLATFORM LENGTHENING AND TRACK RECONFIGURATION

Lengthening platforms at selected Long Island Rail Road (LIRR) stations to accommodate 12-car trains would require limited excavation to install foundations for the extended platform areas. Track reconfiguration would require removing existing trackage (where present), grading, and installing new tracks and switches.

COVERED WALKWAY: LONG ISLAND CITY STATION TO FERRY TERMINAL

Constructing a covered walkway along public right-of-ways from the Long Island City station to the ferry terminal would require minimal construction. Small poles would be mounted in the sidewalk and in the ferry terminal parking lot to support the walkway's overhead structure.

PEDESTRIAN BRIDGE: HUNTERSPOINT AVENUE LIRR STATION TO SUBWAY STATION

The pedestrian bridge connecting the LIRR and subway stations at Hunters Point, to run adjacent to the west side of the Hunters Point Avenue Bridge, would require widening the existing bridge for the approximately 200-foot length between the LIRR platform and subway station. Two additional new bridge piers would be installed to support the bridge, parallel to existing piers. Installing a new, widened stairwell, a new elevator up from the LIRR platform, and opening a new entrance directly into the subway station mezzanine from the walkway, may require temporary closing of portions of the Hunterspoint Avenue LIRR platforms, the Hunters Point subway station, and possibly one lane of traffic along the Hunters Point Avenue bridge. No. 7 subway service might be affected on limited nights and weekends as a result of construction.

PREFERRED ALTERNATIVE

For many of its components, the Preferred Alternative would require construction of underground spaces in the form of tunnels and caverns. Most of this work would be done underground, with limited disruption at the surface. The Preferred Alternative would select among a variety of methods to construct these spaces: tunnel boring machines could construct some tunnels in both rock and soft ground for train routes deep underground, while drill-and-controlled-blasting could be used to excavate both single-track tunnels and large underground spaces. Areas of cut-and-cover excavation would also be required. The following sections briefly describe the construction for each component of the Preferred Alternative, in the approximate order in which they would be built. Construction would begin in early 2001 and continue through 2011.

HIGHBRIDGE YARD MAINTENANCE AND STORAGE FACILITIES

Replacement storage and maintenance facilities for Metro-North Railroad (MNR) trains would be among the first components constructed, before Madison Yard is taken out of service. Subsequent to the clean-up of any contaminated materials (see Chapter 14, "Contaminated Materials"), construction at Highbridge Yard would require removing all existing yard tracks and relocating the Oak Point Link freight tracks to the western portion of the yard, prior to constructing new tracks and buildings. Surface regrading and shallow trenching would be required in some areas (for building and lighting pole foundations). Following site preparation work, the new buildings and maintenance facilities would be constructed.

A covered overpass would cross over the MNR main line tracks providing access to the second floor of the Car Appearance Facility. The overpass would be constructed with a steel frame structure, metal decks, and a concrete topping most likely supported on a pile foundation. A foundation system would be determined after the geotechnical investigation of the site has been completed.

MANHATTAN TRACK ALIGNMENT

The two engineering options being considered for the Manhattan track alignment differ in the depth and alignment of their tracks and tunnels, particularly close to Grand Central Terminal (GCT) under Park Avenue. As such, construction methods for Option 1 (new tracks and platforms in GCT's existing lower level) and Option 2 (new tracks and platforms below GCT's existing lower level) also differ significantly, as described below.

Manhattan Track Alignment—Option 1

Option 1 would require the construction of single-track tunnels and multiple-track openings of various types. Work would take approximately 4 to 5 years to complete.

Single Track Tunnels: 63rd Street Tunnel to Park Avenue. Single-track tunnel construction would extend south and west from Second Avenue and 63rd Street to Park Avenue and 56th Street (for Tracks 1, 2, and 3) and Park Avenue and 48th Street (for Tracks 4 and 5). These tunnels could be constructed either by Tunnel Boring Machine (TBM) or by drill-and-blast construction methods, using controlled blasting techniques. The decision on tunneling methods would depend on the ground conditions, length of tunnels, economical viability, and environmental limitations.

A TBM is basically a large diameter drill that excavates a circular tunnel section. TBMs are custom designed and built for project-specific geology and for the specific requirements of the project being constructed. The TBMs for this project would be designed for the hard, abrasive rock conditions that are anticipated. They would have a diameter of approximately 22 feet, the size required to excavate the single-track tunnels for the LIRR.

Should TBMs be used to create the Manhattan rock tunnels, they would be transported as preassembled elements from the Queens end of the existing 63rd Street Tunnel, just north of Northern Boulevard, through the tunnel itself, to its existing terminus at Second Avenue and 63rd Street in Manhattan. At this terminus, approximately 140 feet below the street, the TBMs would be assembled in a pre-excavated underground assembly chamber and begin to bore the new tunnels. All TBM work would occur entirely underground, with no disruption at the street level in Manhattan.

As the TBM excavates the tunnel, rock supports would be installed behind the TBM cutter head. Rail-mounted gear would contain all necessary facilities for TBM operation. The excavated material (or "muck") would be transported by a combination of rail cars and conveyor belts, from the excavation face, back through the newly excavated tunnel and the existing 63rd Street Tunnel beneath the East River, to a shaft in Queens. Material would then be removed from the tunnel and either taken away via truck, or transported across Northern Boulevard and into Yard A via a conveyor system, and taken away via rail.

If the tunnels are constructed by drill-and-blast methods, using controlled blasting techniques, the tunnel excavation would have a horseshoe shape rather than a circular shape. For the drill-and-blast method, a large number of small diameter holes are drilled into the rock face and loaded with explosives. The explosives are then detonated, fragmenting the rock.

Controlled blasting techniques involve the judicious use of these explosives to excavate the required openings underground. Controlled blasting allows the contractor to excavate the openings with minimal overbreak and with the least possible disturbance of the remaining in-place rock. This is done by drilling more holes but using smaller amounts of explosive per hole. In this manner, the rock breaks to the desired dimension and the blasting vibrations are minimized. Reducing the charge per hole and increasing the number of holes per round spreads the release of energy from the explosives over a longer period, lessening potential ground vibration and air blast at nearby structures. Typically, there would be five or fewer blasting occurances per day, each lasting for only a few seconds.

The type of explosives that would most likely be used for drill-and-blast excavation are called emulsion or water-based explosives, referring to the fact that the explosive is an emulsion of water and the explosive agent. This type of explosive is very safe to handle because it is extremely insensitive to shock and virtually impossible to set off without the proper detonators and boosters. These materials will not explode under duress of shock or heat and have never been set off by fire or even high-velocity firearms.

Once the tunnel is excavated, a final tunnel lining for the single-track tunnels would provide permanent support to the tunnels. Whether the tunnels are constructed by controlled blasting methods or by TBM, the final tunnel lining would be cast-in-place concrete, placed after excavation has been completed for that tunnel. As this lining is placed, voids between the lining and the rock would be sealed by injecting cement grout, under pressure, into the voids. This creates an effective barrier against the seepage of water into the tunnel.

Multiple Track Openings (Various Locations). Multiple-track openings (excavated areas that would carry more than one track) would be required at a number of locations to accommodate the alignment geometry. These areas would include:

- The three-track tunnel containing LIRR tracks 1, 2, and 3 south of 56th Street.
- Approximately four wyes along the alignment. Wyes are locations of diverging or converging tracks.
- The crossover structure at 59th Street, where Track 2 moves from east of Track 3 to west of Track 3.

All of the openings described above would require complete or partial excavation by drill-and-blast methods, using controlled blasting techniques.

The most extensive use of drill-and-blast construction with controlled blasting techniques would occur between 56th and 52nd Streets, where LIRR tracks would rise from beneath the MNR tunnels beneath Park Avenue to run beneath buildings on the west side of Park Avenue. This is described in more detail in the following two sections. This method would also be used to lower the loop track between 43rd and 47th Streets, also described below. Additionally, if a TBM is used to excavate the tunnels, removal of any remaining rock in the caverns would be done via the drill-and-controlled-blast method.

Underpinning of Park Avenue Buildings (52nd to 55th Streets). Traveling south under Park Avenue, the LIRR tracks would gradually rise and then move westward to run beside MNR's lower-level tracks. At 52nd Street, these new tracks west of Park Avenue would enter the existing GCT structure, which extends west of Park Avenue between 42nd and 52nd Streets. Accordingly, as the new tracks shifted west, they would pass beneath the basements of four buildings on the west side of Park Avenue between 52nd and 55th Streets.

The project route for Option 1 passes under four buildings, all of which would need to be underpinned prior to construction of the new tunnels: Racquet and Tennis Club (between 52nd and 53rd Streets), Lever House (between 53rd and 54th Streets), and 400 and 410 Park Avenue (between 54th and 55th Streets). In addition, three streetbeds would need to be opened to construct portions of the tunnels: 52nd, 53rd, and 54th Streets.

The first step involves excavating the area directly north of GCT's existing north wall, under 52nd Street. While sections under 53rd and 54th Streets would be excavated in a slightly different fashion, to allow for the construction of both tunnels and ventilation facilities under those streets (see the discussion of ventilation facilities, below), areas under all three streets would most likely be excavated using cut-and-cover techniques.

Cut-and-cover construction involves excavating down from the street level or ground surface. In these situations, temporary decking can be installed to permit traffic and/or pedestrians to use the street and sidewalk above while construction continues underneath. Cranes would be used as required to move materials into and out of excavation sites. In locations where the crane would be required to swing over the sidewalk, sidewalk sheds would be installed to protect pedestrians.

Work at 52nd Street would be staged to permit traffic to use portions of the street during construction. Work would begin through two openings just west of Park Avenue: one along the southern sidewalk and street and one along the northern sidewalk. Trenches would be dug approximately 50 feet down from each side of 52nd Street. Then, the two trenches would be connected underground, leaving most of the street in place. During this work, the rock and utilities above would be braced with temporary supports until the final tunnel structure is in place. Once permanent roof steel and steel columns are in place under 52nd Street, tunnel excavation would continue northward under the Racquet and Tennis Club building.

To construct tunnels directly under the four buildings west of Park Avenue—the Racquet & Tennis Club, Lever House, 400 Park, and 410 Park, underpinning would be required. Underpinning is a common construction technique that involves placing new foundations under an existing building to allow construction to occur in the area of the original foundations. Figure 17-1 illustrates the underpinning process in four stages, using the Racquet & Tennis Club building as an example of how construction would proceed.

When completed, the tracks for the Preferred Alternative's Option 1 would be located in the rock that currently supports the existing Racquet and Tennis Club's foundation. As shown in Figure 17-1, stage 1 of the underpinning process would involve installation of temporary vertical support columns in "caissons," below the bottom of the new tunnel structure. These caissons would be constructed by drilling through the existing basement and the rock below it. Once the caissons are in place, stage 2 could begin.

Stage 2 would install a structural framing system between the caissons and the existing building's substructure. The new framing system would transfer the building's load from the old columns to the caissons using hydraulic jacks. During the operation, the status of the affected building columns would be closely monitored. Once the connection is made, and the building's load transferred, the building would be supported by the new foundations at a much lower depth than its original rock support.

In stage 3, the existing rock below the original foundation would be removed. This would be accomplished with drilling in conjunction with controlled blasting to excavate the rock in small batches. The new tunnel would be supported by a temporary structure; once the excavation reaches the depth of the new tunnel, the permanent new tunnel structure would be installed as shown in stage 4.

Once the tunnel construction is complete (see final conditions drawing in Figure 17-1), the existing building would rest on top of the new structure, fully supported by the new structure and the rock below. To isolate the building above from vibration and ground-borne noise of train operations, special track fixation methods would be employed. If required, the building columns can be equipped with isolation pads at their connection to the tunnel, to minimize the transmission of vibration (see Chapter 11, "Noise and Vibration," for a full discussion on this issue).

Support of Metro-North Tracks (54th to 56th Streets). As new LIRR tracks 1, 2, and 3 continue toward Queens, they curve eastward from under the buildings at 400 and 410 Park Avenue to under the streetbed of Park Avenue, passing at shallow depths beneath the foundations of the MNR tunnels above. To ensure that construction of these new tunnels does not undermine existing MNR tunnels, the columns supporting them would be underpinned and the soil beneath would be stabilized, potentially by injecting jet grout. Approximately 10 MNR columns would be underpinned. Jet Grouting for soil stabilization involves drilling pilot holes down from the MNR track level, and then injecting a mixture of cement, and water and air under pressure into the soil via injection rods inserted into the pilot holes. As the rods are withdrawn, they are rotated, resulting in a series of columns consisting of the injected cement mixture. These columns consist of a soil and cement grout mixture hardened to a strength suitable to stabilize the soil, and allow construction to occur underneath. This soil stabilization and column underpinning of the MNR tunnels would be required between 54th and 56th Streets.

MNR columns would be underpinned in a similar manner as the building columns, described above. At the location of each MNR column, two mini-piles would be drilled into the rock to a depth below the bottom of future LIRR tunnel. The MNR columns would then be connected to the piles and the load jacked into the new foundations.

Lowering of the Loop Track (43rd to 47th Street). To allow new LIRR trains to use the GCT loop track, the existing lower-level loop track would be excavated to descend at a 3.25 percent grade from south of 44th Street to approximately 47th Street. At 47th Street, it would be low enough in elevation to link to the tunnel already excavated (described above). The new loop track from 43rd to 47th Street would be excavated using drill-and-controlled-blasting methods. During construction, overhead beams that support the existing upper-level storage track, directly above the lower-level loop track, would themselves be supported while the walls of the existing lower-level loop track would be underpinned and the columns extended to the new depth. These measures would permit use of the upper-level storage track during most stages of construction.

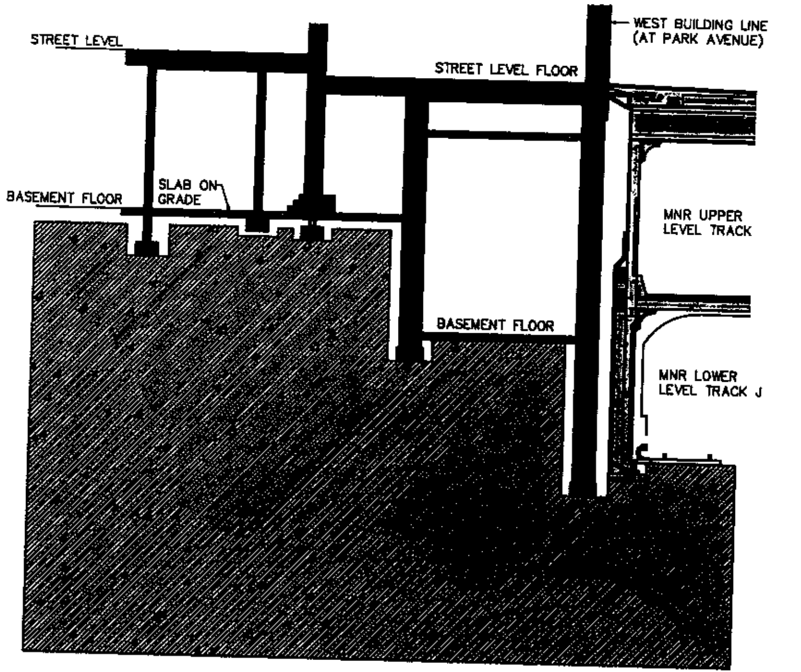
Manhattan Track Alignment—Option 2

By creating tunnels at a much lower depth than in Option 1, Option 2 would eliminate the need to underpin Park Avenue buildings and MNR tunnels. Option 2 would also potentially use TBMs more extensively to construct the new tunnels. In Option 2, TBMs and/or controlled blasting methods would be used to excavate two separate tunnels, each approximately 5,200 feet long, from 63rd to 48th Street (alternately, a single, horseshoe-shaped tunnel to accommodate two tracks could be built using drill-and-blast techniques). From 55th Street to 48th Street, additional TBM and/or controlled-blast tunnels would fan out from the two previously constructed tunnels, to create five caverns containing a total of 10 stub-ended tracks. Each cavern will have two tracks and a center platform. Unlike Option 1, the tunnels in Option 2 would pass more than 70 feet below both MNR tracks under Park Avenue and building basements west of Park Avenue, and 125 feet below Park Avenue itself.

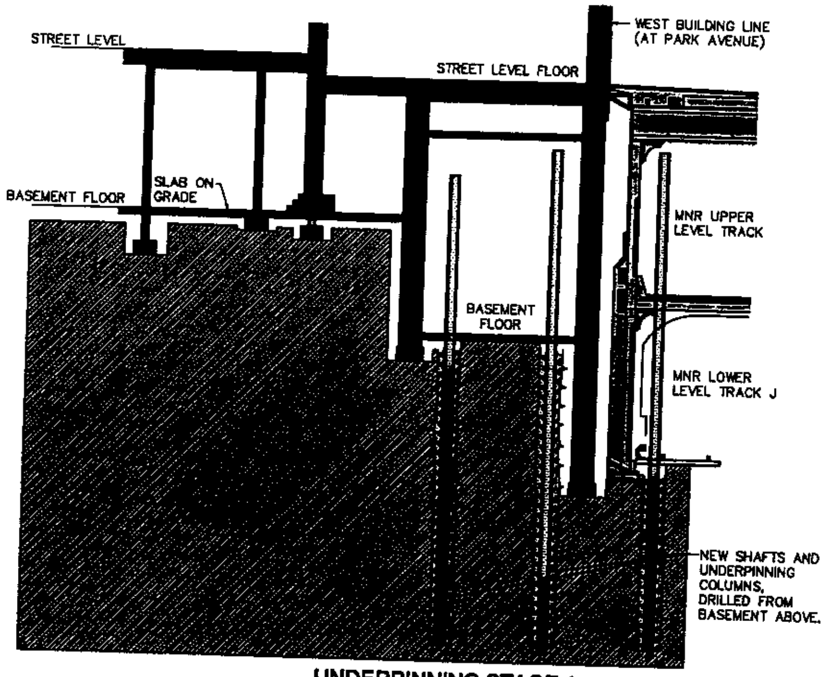
Construction of the tunnels for Option 2 would begin at the existing terminus of the 63rd Street Tunnel and move west and south towards GCT. Should two TBMs be used, they would bore tunnels simultaneously towards GCT and then double-back to create additional tunnels south of 55th Street. TBM usage would also require construction to be timed so that creation of cross passageways and vertical circulation elements at GCT (i.e., passageways that would intersect and provide access to the track and platform areas) would not interfere with construction of train tunnels (see the following section for a discussion of GCT construction elements). In areas where two or more TBM-mined tunnels approach or diverge from each other, drill-and-controlled-blasting would be used to create tunnel segments (as described for Option 1, above). Other areas that may be constructed using either drill-and-controlled blasting or a combination of blasting and TBM include the five caverns under GCT; the throat area between 48th and 55th Streets, where the 2 tracks fan out to form 10 tracks.

GRAND CENTRAL TERMINAL

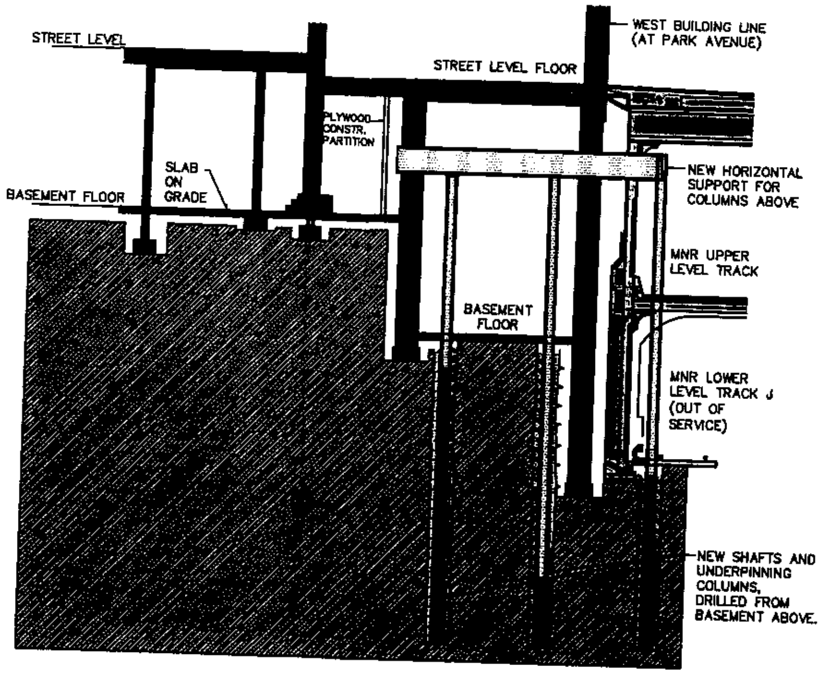
Each of the two engineering options would construct different elements in GCT. New construction for Option 1 would include various escalators and elevators in the western portion of GCT, a removal and reconstruction of lower level platforms and tracks, a new LIRR passenger mezzanine near the existing Suburban Concourse, new LIRR passenger space at the lower level track area, three new cross passageways perpendicular to the new LIRR platforms, and various new exits to the street. New construction for Option 2 would include a track and platform area deep



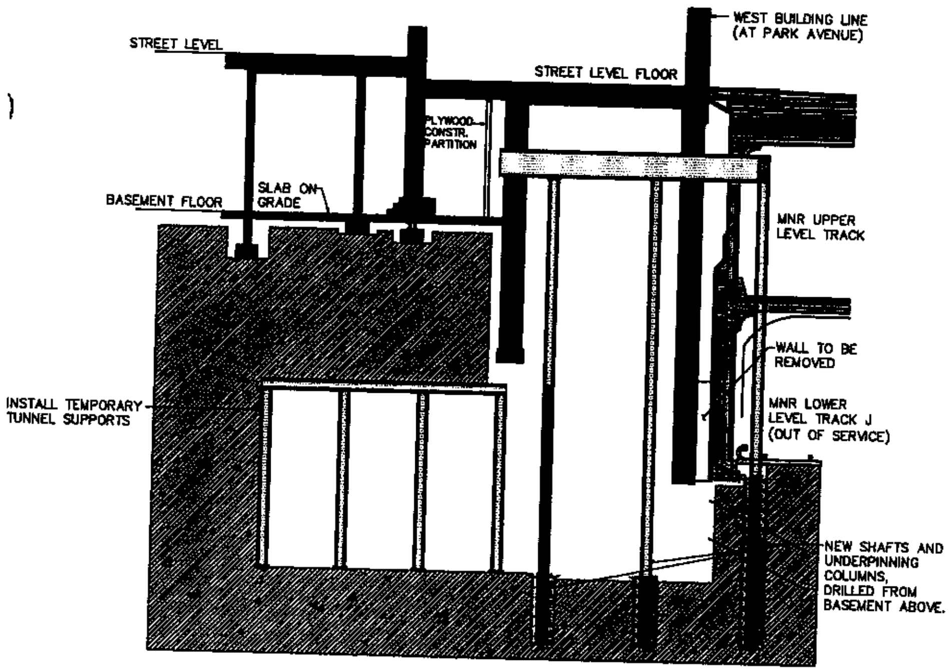
EXISTING CONDITIONS:
BUILDING COLUMNS RESTING ON ROCK



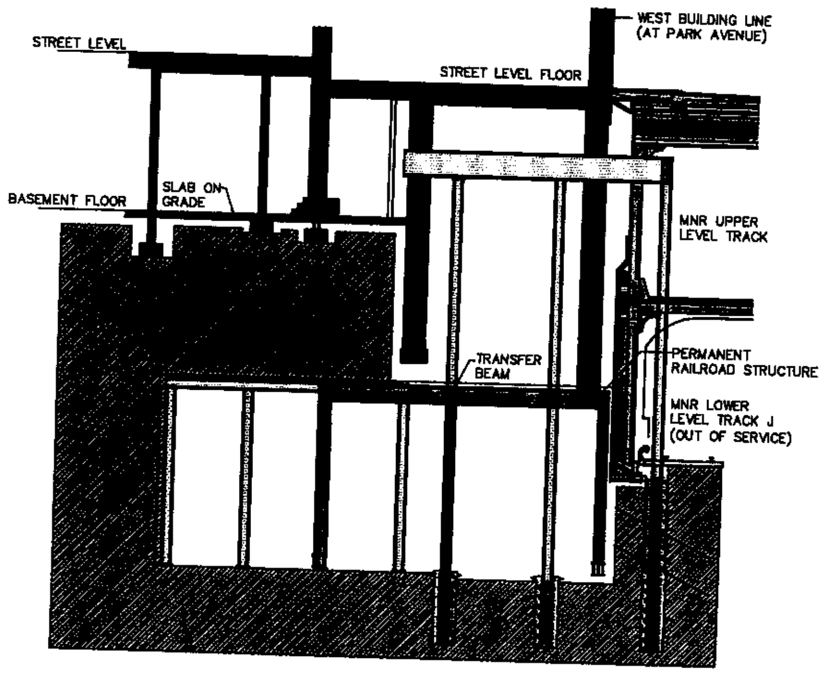
UNDERPINNING STAGE 1:
INSTALL TEMPORARY COLUMNS
THROUGH BASEMENT


STREET LEVEL
WEST BUILDING LINE (AT PARK AVENUE)
STREET LEVEL FLOOR
PLYWOOD CONSTR. PARTITION
NEW HORIZONTAL SUPPORT FOR COLUMNS ABOVE
BASEMENT FLOOR
SLAB ON GRADE
MNR UPPER LEVEL TRACK
BASEMENT FLOOR
MNR LOWER LEVEL TRACK J (OUT OF SERVICE)
NEW SHAFTS AND UNDERPINNING COLUMNS, DRILLED FROM BASEMENT ABOVE.

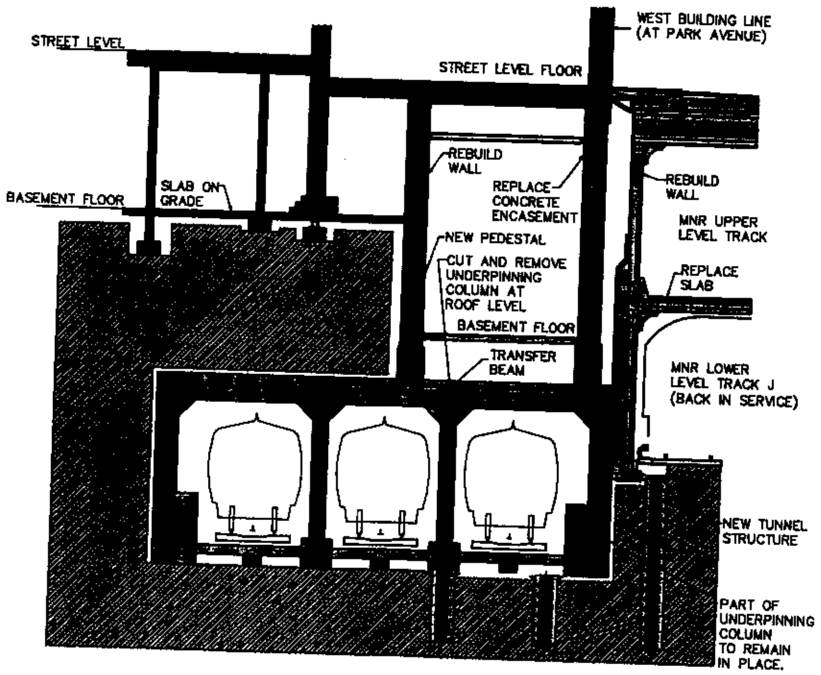
UNDERPINNING STAGE 2:
INSTALL TEMPORARY HORIZONTAL SUPPORT


STREET LEVEL
WEST BUILDING LINE (AT PARK AVENUE)
STREET LEVEL FLOOR
PLYWOOD CONSTR. PARTITION
BASEMENT FLOOR
SLAB ON GRADE
MNR UPPER LEVEL TRACK
WALL TO BE REMOVED
INSTALL TEMPORARY TUNNEL SUPPORTS
MNR LOWER LEVEL TRACK J (OUT OF SERVICE)
NEW SHAFTS AND UNDERPINNING COLUMNS, DRILLED FROM BASEMENT ABOVE.

UNDERPINNING STAGE 3:
REMOVE ROCK AND INSTALL
TEMPORARY TUNNEL SUPPORTS


STREET LEVEL
WEST BUILDING LINE (AT PARK AVENUE)
STREET LEVEL FLOOR
BASEMENT FLOOR
SLAB ON GRADE
MNR UPPER LEVEL TRACK
TRANSFER BEAM
PERMANENT RAILROAD STRUCTURE
MNR LOWER LEVEL TRACK J (OUT OF SERVICE)

UNDERPINNING STAGE 4:
INSTALL TRANSFER BEAM AND
BEGIN PERMANENT RAILROAD STRUCTURE


STREET LEVEL
WEST BUILDING LINE (AT PARK AVENUE)
STREET LEVEL FLOOR
REBUILD WALL
REPLACE CONCRETE ENCASEMENT
REBUILD WALL
BASEMENT FLOOR
SLAB ON GRADE
NEW PEDESTAL
MNR UPPER LEVEL TRACK
CUT AND REMOVE UNDERPINNING COLUMN AT ROOF LEVEL
REPLACE SLAB
BASEMENT FLOOR
TRANSFER BEAM
MNR LOWER LEVEL TRACK J (BACK IN SERVICE)
NEW TUNNEL STRUCTURE
PART OF UNDERPINNING COLUMN TO REMAIN IN PLACE.

FINAL CONDITIONS:
UNDERPINNING COLUMNS REMOVED,
BUILDING COLUMNS RESTING ON
TUNNEL STRUCTURE SUPPORTED BY ROCK

LEGEND

▨	ROCK
■	EXISTING RACQUET CLUB STRUCTURE
▩	EXISTING MNR STRUCTURE
░	TEMPORARY NEW STRUCTURE
▦	PERMANENT NEW STRUCTURE

SCALE IN FEET
0 10 20 30

M T A / L I R R
East Side Access

Figure 17-1
Option 1: Underpinning of Racquet and Tennis Club (Cross-Section Looking North)

under the western portion of GCT, a passenger mezzanine replacing current lower level tracks in the western portion of GCT, cross-passageways and vertical circulation elements connecting tracks and platforms to the mezzanine, and various new exits to the street.

Option 1: Station in the Existing Lower Level of Grand Central Terminal

Option 1 would use existing track, platform, and concourse space for new LIRR tracks, platforms, and concourses. The demolition and reconstruction within GCT would not require major excavation of rock. However, significant underpinning and reconstruction of existing columns supporting the train shed and buildings above would be required. Additionally, rock would have to be excavated to lower the GCT lower-level loop track and to create entrances to the new station from the street.

For the most part, LIRR tracks and platforms would be constructed where existing tracks and platforms are located. This would require re-framing and relocating existing columns, removing and rebuilding all platforms and tracks west of MNR track 112, and removing the existing wall that separates MNR tracks from Madison Yard tracks. In addition, tracks in MNR's East Yard (in the lower level) would be taken out of service for the purposes of expansion and reconfiguration.

Then, new tracks and platforms for the LIRR would be constructed. Work would require relocating columns and expanding the narrow tunnels in GCT between 48th and 51st Streets to allow for more extensive track connections and switches. At the same time, two cross passageways, at 45th and 48th Streets, would be constructed above and perpendicular to new LIRR tracks, in existing air space within GCT. This would require rebuilding the structural support system for some upper-level tracks. A third cross passageway, between 43rd and 44th Streets, would be constructed in an existing space below GCT's lower level tracks.

Exits would be constructed from new GCT space up into buildings and onto sidewalks, along with platforms and cross-passageways. This would entail closing off the affected portion of the building space or sidewalk and excavating from the sidewalk down to the cross passageway below. The construction of the new 45th Street cross passageway would require cut-and-cover construction from the streetbed above. Construction of off-street entrances at 45th and 48th Streets, as well as the new stair to the 47th Street cross-passageway would require breaking through MNR platform P at the upper level of GCT. The exit to be located inside the building at 347 Madison Avenue would be constructed through the ground floor and basement of the affected space in that building. GCT platform, cross-passageway, and access work would last approximately 2½ years.

The project would also require construction in GCT at the lower track level, Suburban Concourse level, and Main Concourse level to create stairs, escalators, elevators, and new waiting and ticketing areas. These portions of GCT would be closed off during this process. Work in GCT would occur towards the end of construction and last approximately 2½ years.

Option 2: Station Below the Existing Lower Level in Grand Central Terminal

Option 2 would require relatively little major new construction in the public spaces of GCT. As in Option 1, constructing the GCT elements of Option 2 would require the removal of all lower level platforms and tracks west of track 113 (including those in Madison Yard) along with the wall that separates MNR tracks from Madison Yard tracks. This area would be reconstructed as a new mezzanine, rather than with the tracks and platforms of Option 1. Little underpinning or reframing of existing columns would be required, except in areas where stair/escalator wells lead down to the new cross-passageways. In these locations, some existing columns would need to be underpinned.

Construction of the elevators, escalators, and cross passageways (beneath the lower level); and the platforms and tracks (beneath the cross passageways) would proceed in stages either down from the mezzanine or up from the track/platform cavern. Space for elevators and escalators would be excavated using controlled blasting methods. The rock would be transported upward into the GCT construction area. Approximately 40 feet below the mezzanine (and 100 feet below the street), the cross passageways would be excavated using controlled blasting methods, proceeding horizontally from the escalator shafts.

As the cross-passageways are being constructed, the five track and platform areas would also be excavated using TBM and/or controlled blasting methods. One scenario is for one or two TBMs to continue south into the track/platform area after they have completed the two approach tunnels to the north (described above). Using these two TBM tunnels as a starting point, a combination of controlled blasting methods, along with TBMs, would be used to enlarge these caverns to the west and east, creating the remainder of the track and platform area. If only controlled blasting methods are used to excavate the approach tunnels, the platform area construction would proceed in a similar manner.

Exits from the mezzanine to the street would be constructed in the same fashion as described for Option 1, above, with the exception that the exits would access the mezzanine area rather than crosspassageway areas.

THE EXISTING 63RD STREET TUNNEL

The lower level of the 63rd Street Tunnel would require minor rehabilitation and construction to prepare it for train use. A trackbed and tracks would be laid, a safety walk and duct bank would be constructed in each trackway, existing ventilation facilities would be outfitted with equipment to serve the lower level tunnels, and permanent drainage, signals, lighting, communication, and power systems would be installed.

MANHATTAN VENTILATION FACILITIES

To construct the ventilation facilities in the vicinity of Park Avenue for both Option 1 and Option 2, portions of the affected streets would, to varying degrees, be occupied by open cuts in the street and sidewalk, construction laydown areas, trailers, and parking for workers. What follows is a brief description of construction activities. Detailed impacts of construction on pedestrian and vehicular traffic, as well as surrounding land uses, can be found in Section C: Possible Impacts of the Preferred Alternative During Construction.

Option 1

Of the four ventilation plants required for Option 1 of the Preferred Alternative in Manhattan (a new LIRR terminal in the lower level of GCT), two would be constructed under 54th Street (between Park and Madison Avenues, and between Lexington and Park Avenues), one would be installed inside an existing ventilation facility at 63rd Street east of Second Avenue, and one would be constructed as a new structure at 47 East 44th Street. In addition to these four ventilation plants, the tunnels in Option 1 would impact an existing ventilation facility under 53rd Street (between Park and Madison Avenues), that currently serves New York City Transit's (NYCT) E and F subway lines. This facility would need to be reconstructed (and would take approximately 2 years).

54th Street Facilities. These two facilities (as well as the 53rd Street Facility) would principally be constructed using cut-and-cover construction techniques. An exception is the fan room for the facility east of Park Avenue, which would be constructed using tunneling methods. At each location, part of the sidewalk on one side of the street and one lane of traffic would be closed temporarily.

As the excavation proceeds, utilities beneath the street would be relocated or supported in place. At 53rd Street, the street would be excavated to the depth of the E and F subway line that runs below, approximately 50 feet deep. At 54th Street, the street would be excavated to a maximum depth of approximately 75 feet. Once the excavation is 8 to 10 feet deep, the opening at street level would be covered to allow for street and pedestrian traffic, and vent construction work would continue underneath for approximately 2 to 2½ years. During this period, the street-level decking would periodically be removed to allow materials to be delivered to the excavated area underneath. Construction of both the 53rd and the 54th Street ventilation facilities may require complete closure of the street for short stretches of time.

Second Avenue Facility. New ventilation-related equipment at 63rd Street east of Second Avenue would be installed entirely inside the existing facility there, as would emergency egress and maintenance access to the 63rd Street Tunnel. No major construction is anticipated.

47 East 44th Street Facility. To ventilate the LIRR train shed at GCT, a new, above-ground facility would be constructed in place of an existing five-story commercial building. This would require demolition of the existing building and construction of the new structure over a period of approximately 2 years.

Option 2

As described in Chapter 2, "Project Alternatives," Option 2 calls for the creation of four ventilation facilities in Manhattan. Two would be in the same locations as for Option 1 (on East 44th Street and at 63rd Street east of Second Avenue) and two would be in other locations (under 55th Street between Park and Madison Avenues, and in an area currently occupied by GCT's lower level tracks between 48th and 52nd Streets).

47 East 44th Street. Option 2 would construct both a ventilation facility and a heating and air conditioning plant on 44th Street, to serve the LIRR mezzanine. Construction would take a similar amount of time as with Option 1.

Second Avenue Facility. Construction of the facility at Second Avenue would be the same as described above, for Option 1.

55th Street. The new ventilation facility under 55th Street would be constructed principally by mining from the underside of the street. Cut-and-cover construction would be needed for the sidewalk gratings and creation of the ventilation shaft itself. A portion of the sidewalk and one lane of traffic would be temporarily closed to permit excavation for the facility. In addition, for short periods of time, the entire street may be closed to facilitate certain construction activities The total construction time would be 2½ years.

GCT between 48th and 52nd Streets. The new ventilation facility in the lower level of GCT would be constructed underground and would require a temporary sidewalk and partial street closing at 49th and 50th Streets west of Park Avenue to install ventilation grates.

MANHATTAN SUBSTATIONS

Under both Option 1 and Option 2, construction of the substation between 51st and 52nd Streets, located in the upper level of the GCT train shed, would take place inside GCT. It would require the creation of an access hatch in the 52nd street sidewalk; ventilation gratings in sidewalks on 51st Street, Park Avenue, and 52nd Street; and new walls within the GCT train shed.

For Option 1, a substation would be constructed under 54th Street as part of a planned ventilation facility and would not entail work beyond the scope of work for that facility (as described above). For Option 2, this substation would be constructed as part of the planned ventilation facility at 55th Street rather than 54th Street.

At 63rd Street east of Second Avenue, substation equipment would be installed entirely within the existing facility at this location.

ROOSEVELT ISLAND SUBSTATION

To create a substation on Roosevelt Island next to the existing 63rd Street Tunnel ventilation shaft, a 40- by 60-foot area would be excavated adjacent to the north wall of the existing shaft. In addition to this excavation, a manhole would be built to tie into Con Edison's existing power lines. A small duct linking this manhole to the substation would be constructed (requiring a shallow trench to be dug). Construction at Roosevelt Island would last approximately 1 year.

RELOCATION OF NEW YORK & ATLANTIC RAILWAY (NYAR) FROM YARD A IN QUEENS

One of the first project elements that would be completed in Queens is the relocation of NYAR storage and maintenance facilities from Yard A, potentially to Fresh Pond Yard and either Blissville or Maspeth Yard. Construction at each yard would last approximately 1 year.

Blissville or Maspeth Yard

Construction of new tracks, switches, and lighting at either Blissville Yard or Maspeth Yard would require shallow trenching and regrading in the vicinity of the new tracks. Both yards would also require new track connections to the LIRR Montauk Branch mainline. At Blissville, the existing track and ballast would be removed before the new tracks could be laid.

Fresh Pond Yard

Construction at Fresh Pond Yard would consist of a new maintenance facility for NYAR and new yard lead tracks into the building. The current double-wide trailer in the center of the East Yard would be removed and an area of approximately 6,000 square feet would be cleared for the construction of a pre-engineered, metal panel maintenance building with a concrete slab foundation. A pit would be dug inside the new building to create an area for maintenance of the undercarriage of trains. Connections for power, communications, water, and sewer would also be provided.

QUEENS TRACK ALIGNMENT

To connect the LIRR Main Line, Port Washington Branch, and loop tracks leading to Yard A (all at Harold Interlocking) to the existing 63rd Street Tunnel (just north of Northern Boulevard at 41st Avenue), two types of construction methods would be used. From the tunnel bellmouth to the buildings at the northern edge of Sunnyside Yard, tunnels would be excavated from the surface using the cut-and-cover method. From the Sunnyside Yard track area to the Main Line, Port Washington Branch, and Yard Lead connections to the loop track, tunnels would be constructed using both a TBM (for areas under Sunnyside Yard) and by cut-and-cover and open-cut excavation (as the tunnels approach the grade level of Harold Interlocking). Figure 17-2 illustrates key elements of construction work for the Queens track alignment, described below.

Cut and Cover: 63rd Street Tunnel to Yard A

Just north of Northern Boulevard near 41st Avenue, the lower level of the existing 63rd Street Tunnel terminates at a bulkhead wall (this area is called the tunnel's "bellmouth," since the track area begins to widen here), while the two tracks from its upper level curve east to connect to existing NYCT subway lines. To extend the currently stub-ended tracks (and two additional NYCT tracks that also end at the bellmouth) south toward Sunnyside Yard, the existing bulkhead would be removed and a new cut-and-cover tunnel would be constructed. This section would run from the bellmouth, underneath Northern Boulevard and the subway running beneath Northern Boulevard. It would continue south of Northern Boulevard, through Yard A, to the edge of Sunnyside Yard.

Typically, when earth is excavated to a depth below the groundwater level (as would be the case in Queens), water is pumped out of the area of excavation. However, because of concerns about contaminated materials in the groundwater at Sunnyside Yard, this excavation would be enclosed with virtually watertight walls. The first component to be constructed would be the walls of this enclosed excavation, or "bathtub," which would extend down to the rockline, below the water table. This bathtub would allow de-watering to take place within its walls without causing a draw-down of the water table or movement of the groundwater outside its walls. Creating the bathtub under Northern Boulevard and the subway, and excavating the earth within the bathtub, would occur in stages to allow for operation of both the street and the subway with minimal disturbances.

First, the NYCT buildings at 2950 and 2970 Northern Boulevard, as well as several Amtrak buildings at Sunnyside Yard just south of Yard A, would be demolished and the site cleared for construction. Subterranean construction would begin with the creation of walls of the new bathtub on either side of Northern Boulevard. These would be slurry walls, created by excavating the ground where the wall is to be placed and filling it with a bentonite (clay-type) slurry to hold the ground in place. Once the ground for the wall is excavated and filled with slurry, concrete would be pumped into the slurry mixture, replacing it from the bottom up, and creating a permanent wall.

Next, under Northern Boulevard (and the subways above and below it), the walls of the bathtub would be created. Proceeding in stages so that some lanes of traffic could remain open at all times, utilities would be relocated, trenches would be dug from the street, and temporary decking would be placed on top of the trenches to allow for traffic above. Then, jet grouting would proceed similar to the way in which soil would be stabilized under MNR tracks in Manhattan (discussed in "Support of Metro-North Tracks," above). Pilot holes would be drilled down from the street, along the wall lines, jet grout injection rods would be inserted into the pilot holes, and jet grout would be injected into the soil to create walls made up of a number of interlocking columns. The jet grout columns would be formed by injecting into the ground, under pressure and rotation, a mixture of cement grout, water, and air. The cement grout would mix with the soil and form a cemented soil called "soil-crete." Multiple rows of jet grout columns are required to provide the cut-off wall and sufficient support for excavation.

Once these walls are in place, both the elevated and underground subway tracks would be underpinned to allow for excavation of the cavern beneath them. The underpinning would most likely be done either by the "pile" or the "pit" method. The pile method involves drilling a series of small diameter piles down into the ground and re-supporting the tunnel on them. This is similar to the way in which the subway structure was underpinned as part of the 63rd Street Connection project. The pit method involves excavating a series of pits, by hand, under the subway box, and filling those pits with concrete to form pillars for the tunnel to be supported on.

Once this bathtub and subway underpinning are in place, excavation for the new LIRR and NYCT tunnels would take place inside the bathtub. All rock, soil, and water would be excavated from the bathtub. Beneath Northern Boulevard, this work would occur underground from the trenches described above.

During excavation of the bathtub and construction of the structures within the bathtub, most operations at Yard A would be suspended, with the following exceptions:

- Spoils from the Third Water Tunnel project would continue to be transported through Yard A. This route may also be used to dispose excavated rock from the Manhattan tunnel construction.
- Amtrak would continue to access its High Speed facility at the western limit of Sunnyside Yard between Yard A and the location of the launch shaft, via temporary tracks.
- NYAR would continue to have access to the Arch Street Yard west of Yard A, from the east, via a temporary track.

TBM: From Yard A to Connections with Main Line, Port Washington Branch, and Loop Tracks

Five new tunnels would be constructed beneath Sunnyside Yard using TBM(s), to avoid disrupting the yard operations above. Unlike in Manhattan, where the tunnels would be bored through hard rock, subsurface conditions at Sunnyside are a mixture of rock and soils of different types. This would call for the use of one of two types of TBMs. One is an Earth Pressure Balance Tunnel Boring Machine, which exerts soil pressure on the tunnel face as it carves out the rock and soil. The pressure prevents extra rock and soil from coming loose as the tunnel is bored, avoiding ground settlement, groundwater seepage, and cave-ins. Another type of TBM that could be used is a Slurry Shield TBM, which prevents soil settlement by mixing excavated soils in a slurry as they are removed, using the slurry to exert pressure on the face of the tunnel. This Slurry TBM constantly removes the soil/slurry mixture from the tunnel and replaces the mixture with new slurry at the tunnel face. The removed slurry is then separated from the excavated material at a slurry plant (which would be located in Yard A) and returned to the tunnel face for reuse.

Either one or two TBMs or two TBMs working simultaneously would create the tunnels in Queens. The TBM(s) would begin work by breaking through the walls at the edge of the bathtub at Yard A. From this TBM launch site, tunnels would be bored beneath Sunnyside Yard to emerge at exit portals just west of the 39th Street Bridge. At the exit portals, the tunnels would gradually ascend for a length of approximately 200 feet before emerging from underground. When the tunnels emerge from underground, tracks would continue to rise in open cuts with retaining walls for approximately 500 to 650 feet (varying by approach), until reaching grade level between active LIRR and Amtrak tracks west of 43rd Street.

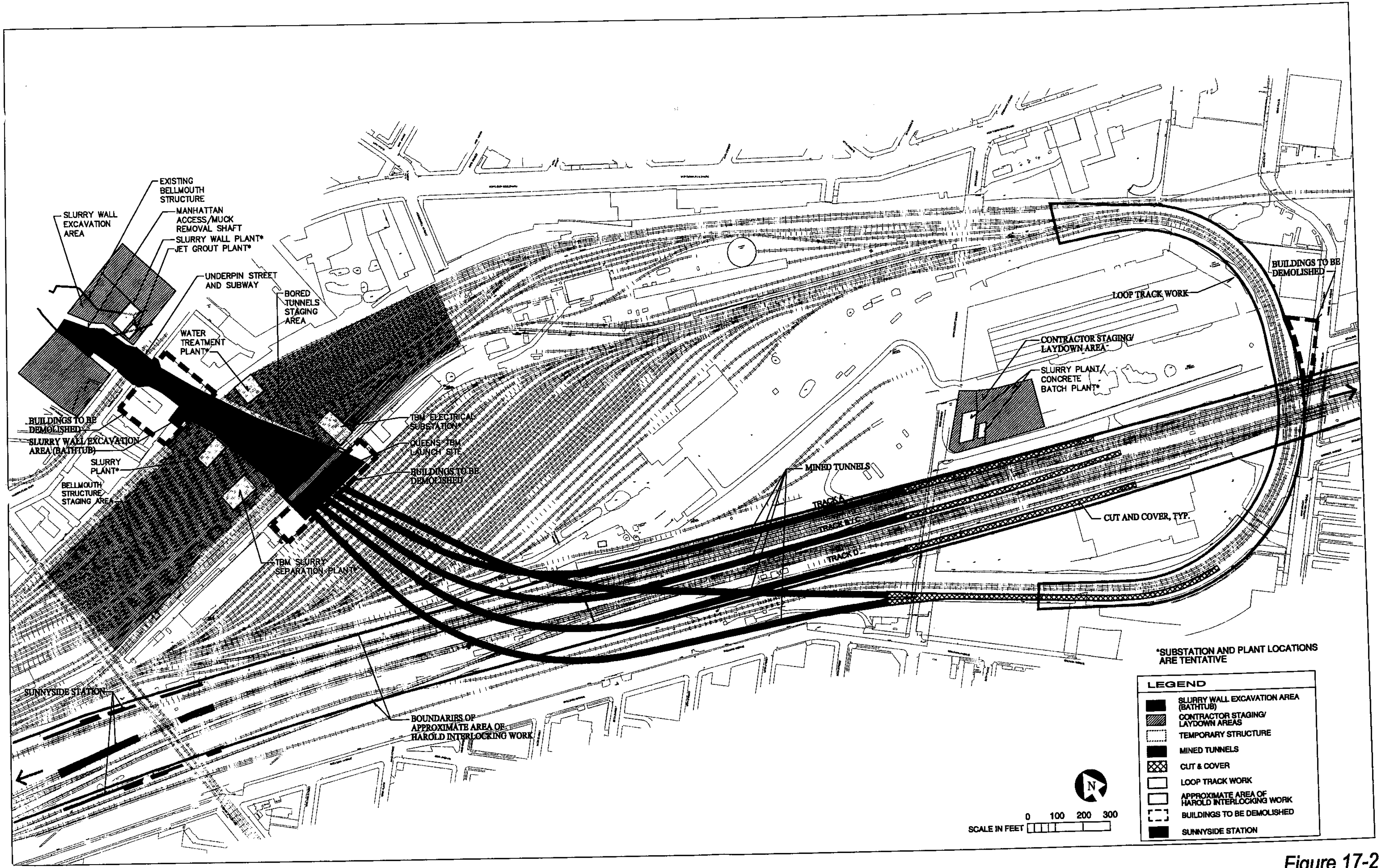

EXISTING BELLMOUTH STRUCTURE
SLURRY WALL EXCAVATION AREA
MANHATTAN ACCESS/MUCK REMOVAL SHAFT
SLURRY WALL PLANT*
JET GROUT PLANT*
UNDERPIN STREET AND SUBWAY
BORED TUNNELS STAGING AREA
WATER TREATMENT PLANT*
BUILDINGS TO BE DEMOLISHED
SLURRY WALL EXCAVATION AREA (BATHTUB)
SLURRY PLANT*
BELLMOUTH STRUCTURE STAGING AREA
TBM ELECTRICAL SUBSTATION*
QUEENS TBM LAUNCH SITE
BUILDINGS TO BE DEMOLISHED
TBM SLURRY SEPARATION PLANT*
MINED TUNNELS
TRACK A
TRACK B/C
TRACK D
CUT AND COVER, TYP.
LOOP TRACK WORK
BUILDINGS TO BE DEMOLISHED
CONTRACTOR STAGING/ LAYDOWN AREA
SLURRY PLANT/ CONCRETE BATCH PLANT*
SUNNYSIDE STATION
BOUNDARIES OF APPROXIMATE AREA OF HAROLD INTERLOCKING WORK
*SUBSTATION AND PLANT LOCATIONS ARE TENTATIVE
LEGEND
SLURRY WALL EXCAVATION AREA (BATHTUB)
CONTRACTOR STAGING/ LAYDOWN AREAS
TEMPORARY STRUCTURE
MINED TUNNELS
CUT & COVER
LOOP TRACK WORK
APPROXIMATE AREA OF HAROLD INTERLOCKING WORK
BUILDINGS TO BE DEMOLISHED
SUNNYSIDE STATION
N
0 100 200 300
SCALE IN FEET

Figure 17-2

Queens Construction Techniques

Ventilation Facility Along Track Alignment

When the construction of tunnels in the vicinity of Yard A is complete, a ventilation facility would be constructed just above the tunnel structures (as described in more detail below). This facility would extend from Northern Boulevard across Yard A, just above the roof of the new train tunnels.

Emergency Exit Tunnel Along Track Alignment

In addition to the train tunnels, the project would also construct an emergency exit tunnel east of the Honeywell Street bridge, across the top of the three new revenue service tunnels. This tunnel would probably be excavated manually, using soil stabilization methods such as freezing, jet grouting, or chemical grouting.

LIRR STORAGE AND MAINTENANCE FACILITIES

Constructing facilities for LIRR trains to be stored and maintained during the midday involves work at Yard A and at the loop track linking Yard A to Harold Interlocking. Construction in each of these areas is described below.

Midday Train Storage Facilities at Yard A

The construction of storage tracks in Yard A would commence after cut-and-cover tunnels under Yard A and the bored tunnels under Sunnyside Yards are complete. It would entail grading the surface, laying new tracks and power feeds, and installing utilities in shallow trenches.

Due to the historically swampy nature of the western end of Yard A, constructing the service and inspection facility there may require pile foundations and excavation of unsuitable soils. Similarly, yard lighting would require overhead supports. The train washer facility at Yard A would be constructed on conventional spread footings four to five feet deep.

Train Access to Yard A: The Loop Track

To provide access for LIRR trains to Yard A, a fourth loop track would be built inside of the three existing loop tracks used by Amtrak. Construction would require physical adjustments to all three existing loop tracks, as well as creating a section of tunnel crossing under the embankment that carries Main Line and Port Washington Branch tracks west of 43rd Street. It would also require constructing a new retaining wall to widen the loop track's existing open cut right-of-way. Additionally, a bridge leading to a General Motors facility across the existing loop tracks would have to be removed and rebuilt to accommodate the new loop track. Each of the components of the new Yard A Loop Track would be constructed as part of Stage 1 of the Harold Interlocking work, described below.

IMPROVEMENTS AT HAROLD INTERLOCKING

As excavation and tunneling work proceeds in Yard A and Sunnyside Yard, construction work at Harold Interlocking, as well as related improvements to the area, would also be taking place. This work would be staged to minimize disruption to commuter and other rail services through Harold Interlocking and to coincide with key construction elements for the 63rd Street Tunnel extension. Improvements in the vicinity of Harold Interlocking would occur in five stages, as outlined below:

- Stage 1: Construction of detour tracks, switches, and crossovers for LIRR and Amtrak trains. This first step would permit work to occur on Main Line and Port Washington tracks while preserving operations through the interlocking. New tracks would be constructed to detour existing train traffic from lines that would be affected by work in future stages. In addition to constructing new trackage, additional work at this stage includes demolishing the building at the northwest corner of 43rd Street and the LIRR viaduct bridges, relocating the vehicular bridge to the GM plant, relocating 39th Street bridge piers, and constructing the new loop track tunnel and retaining wall.

- Stage 2: Re-routing of trains onto temporary trackwork and construction of permanent new tunnels. Once train traffic has been detoured to the trackage constructed in Stage 1, the tunnel elements of the Harold Interlocking improvements would be constructed. Cut-and-cover methods could be used to construct these two short sections of tunnel. This stage would also include relocating one Honeywell Street bridge pier and underpinning two others, as well as relocating one Thomson Avenue bridge pier.
- Stage 3: Construction of viaduct structure in vicinity of 48th Street, including widening of 43rd Street and 48th Street rail bridges. This structure would start as a widening of the embankment that carries LIRR tracks in an east-west direction, and continue as a viaduct that crosses over LIRR tracks as it approaches 48th Street. LIRR trains would continue to operate through this area on relocated tracks (Stage 2).
- Stage 4: Reconstruction of center routes through Harold Interlocking, construction of new Sunnyside station "headhouse," and construction of two side platforms for Sunnyside station. This stage would bring new Harold Interlocking tracks into operation and restore previously decommissioned tracks. At the conclusion of Stage 4, the new Harold Interlocking tracks would be ready for use by Amtrak and some LIRR Port Washington Branch trains.
- Stage 5: Completion of Sunnyside station and adjacent tracks. Work to complete construction the new LIRR station at Queens Boulevard in Sunnyside would occur as part of the final two stages of improvements at Harold Interlocking, and is discussed below.

The work on Harold Interlocking would involve creating a new viaduct to carry trains just south of the existing tracks between 43rd and 48th Streets, just east of Sunnyside Yard. As part of this work, the railroad bridges above 43rd, 44th, 45th, 46th, 47th, and 48th Streets would require some reconstruction work. In addition, it is possible that to create adequate space for construction activities to take place while maintaining Amtrak and LIRR train service, properties along the north side of Barnett Avenue between 43rd and 48th Street might need to be acquired. If this is required, these structures would be demolished to create a construction staging area on the north side of Barnett Avenue.

SUNNYSIDE STATION

Two access options are being considered for the construction of the new Sunnyside station. The first option would provide truck access from Skillman Avenue for the delivery of heavy materials and equipment. The second option would involve constructing the overhead pedestrian walkways first and then using them to access the remainder of the construction site. This would minimize the potential disruption to the mainline tracks. Construction workers, small equipment, and some materials could be brought in through the walkways; however, heavy materials and large equipment would still need to use the Skillman Avenue entrance.

In either case, construction staging would occur in the yard in the area between Skillman Avenue and the south yard lead track. Construction of the south (eastbound) platform would be similar under both options. The construction of this platform may require that the south yard lead track be taken out of service at various times during the day or the use of a flagman controlled crossing.

For the center island platform and the headhouse, the first option would require access from the Queens Boulevard bridge and possibly a new spur track to provided rail access to the construction site. The second option would use the pedestrian walkway bridges, or railcar via construction of a new spur track similar to the first option. This would eliminate the need to bring equipment and materials via the Queens Boulevard bridge.

For construction of the north or westbound platform, the first option would probably require a small hoist or platform off the Queens Boulevard bridge. The sidewalk and one eastbound traffic lane would have to be closed for limited periods, subject to NYCDOT approval. To minimize traffic impacts on the bridge, materials would be brought during off-peak hours. Depending on the grade, it may also be possible to construct a spur track off the yard lead to remove excavated materials by railcars. The second option would not require the construction of a platform on the south side of the bridge since the overhead walkways could be used for access.

QUEENS SUBSTATIONS AND VENTILATION FACILITIES

In Queens, a combined substation and ventilation facility would be constructed as part of the cut-and-cover construction of new LIRR tunnels under 2950-2970 Northern Boulevard, Yard A, and the edge of Sunnyside Yard. All new underground construction in this area—tunnels, the ventilation facility, and the substation—would be part of one unified structure running from the existing 63rd Street Tunnel bellmouth just north of Northern Boulevard, to the northern edge of Sunnyside Yard. The tunnel/substation/ventilation structure would also include an employee facility above ground, fronting on Northern Boulevard.

In addition, an existing substation enclosure within the existing 63rd Street Tunnel ventilation facility in Queensbridge Park would be equipped to serve the tunnel's lower level tracks. The existing underground facility would be structurally re-framed to accommodate additional equipment. This work would take place inside the existing structure and materials would be delivered to the site through existing hatches. A manhole would be created at the park's edge in the bed of Vernon Boulevard to link to Con Edison's power system, and an approximately 50-foot-long duct would have to be installed to bring power to the substation. This duct would be constructed using shallow trenching. Work to equip the substation would last approximately one year.

SPOIL DISPOSAL FOR THE PREFERRED ALTERNATIVE

Creating tunnels and other underground spaces for the Preferred Alternative would result in a large volume of excavated material, or spoil, that would require either removal to an off-site location, or re-use on site. The majority of spoil would be generated by three construction activities: Manhattan bored and mined tunnels, Queens cut-and-cover tunnels, and Queens bored tunnels. In addition, the creation of new underground ventilation facilities, entrances, passenger concourse areas, platforms, and other spaces in and around GCT would generate spoil.

Manhattan Tunnels

Option 1. Option 1 would generate approximately 180,000 bank* cubic yards (CY) (or 310,000 loose CY) of hard bedrock to be transported off-site. The maximum daily generation of spoil would be approximately 600 bank CY (or 1,000 loose CY).

Material excavated to construct the tunnels from 55th Street to 63rd Street would be removed from the excavation location by a combination of rail haulage and conveyor systems through the existing tunnels extending beneath the East River, to a shaft in Queens. From this shaft, the spoil would be conveyed above Northern Boulevard, under the overhead subway structure, across the properties just south of Northern Boulevard, and into a muck pile in Yard A. Steel nets would be provided to prevent debris from falling from the overhead conveyor onto cars traveling along Northern Boulevard. This conveyor would provide continuous operation without the need to interrupt street traffic for the passage of muck trucks. Removal of spoil from Yard A is described in the "Stockpiled Spoil from Queens and Manhattan Tunnels," below.

Spoil from the tunnels excavated between 52nd and 55th Streets would be transported principally by truck, after the material is lifted by crane from below through the street openings.

Option 2. Option 2 would generate approximately 160,000 bank cubic yards (or 270,000 loose CY) of material to be transported off-site. As in Option 1, the maximum daily generation of spoil would be approximately 600 bank CY (or 1,000 loose CY).

For Option 2, material excavated from tunnels would be transported either back through the new tunnels and the existing 63rd Street Tunnel into Queens, as in Option 1, or through the lower level of GCT to be hauled out by trains via Metro-North tracks to the Bronx. Unlike Option 1, Option 2 would not require trucking of spoil from the Manhattan Tunnels. The only trucking of spoil that would be required, would be from portions of the 55th Street ventilation facility, and from new GCT street entrances (described below).

Grand Central Terminal

Option 1. All debris and excavated material resulting from work in GCT would be taken via rail cars along MNR tracks, to points north. Material excavated for station entrances and facilities at the street level would be hauled out by truck. The most likely destination for these spoils would be Metro-North's BN yard, located in the Marble Hill section of the Bronx. From BN yard, spoil would be removed via truck to locations to be determined by the contractor, most likely using the Major Deegan Expressway.

Option 2. As in Option 1, the debris and material excavated for the creation of the LIRR mezzanine, vertical circulation elements, and cross-passageways would be removed from the site via rail cars operating along existing MNR tracks, perhaps to BN yard. The rock excavated to create the LIRR track and platform areas underneath the mezzanine and cross passageways would be removed from the site via the newly constructed LIRR tunnels and the existing 63rd Street Tunnel into Queens, in the same fashion as for the spoil from Manhattan. As for Option 1, material excavated for station entrances and facilities at the street level would be hauled out by truck.

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* "Bank" volumes are pre-excavated, or in-place volumes of spoil. To convert to loose volumes, bank volumes are multiplied by a "swell ratio", by which the spoil will grow in volume as a result of being released from underground pressures. Swell ratios for rock are typically 1.4 to 1.5, while soil swell ratios are usually from 1.3 to 1.4.

Queens Tunnels

The excavation of Queens tunnels would result in the following volumes of excavated material, which would either be re-used on-site, or transported off-site:

- For the cut-and-cover structure in the vicinity of Yard A, 300,000 bank CY (or 500,000 loose CY);
- For the bored tunnels under Sunnyside Yard and Harold Interlocking, 150,000 bank CY (or 250,000 loose);
- For the bored tunnel approach structures, 70,000 bank CY (or 120,000 loose); and
- For the Harold Interlocking improvement tunnels, 50,000 bank CY (or 85,000 loose).

Approximately 190,000 bank CY would be used as backfill over the completed structures to restore existing grades. One possible use of some of the remaining Queens spoil would be as fill for Yard A and other embankments in the Queens construction area. Yard A is currently about 8 to 12 feet lower than adjacent properties fronting Northern Boulevard and Sunnyside Yard. Some fill could also be used for embankments to be constructed as part of the Harold Interlocking Improvements, but this would depend on the final construction staging for elements in Queens.

Stockpiled Spoil from Queens and Manhattan Tunnels

The stockpiling of spoil in Yard A would permit remaining material from both Queens and Manhattan to be removed by rail, in the same fashion as spoil from the Queens leg of the New York City Department of Environmental Protection's (NYCDEP) Third Water Tunnel is currently being transported to Eastern Long Island. For the water tunnel, spoil is hauled from the site by NYAR, through Yard A, to the Ronkonkoma Branch of the LIRR, to a private material stockpile yard near Holtsville in eastern Long Island.

Another, option would be to remove the spoil from Yard A via truck. This would result in the generation of approximately 225 truck trips per day during peak periods of tunneling work. Due to the potential for a large number of both daily truck trips and total truck trips (since nearly 750,000 bank CY of material could potentially require transport from Yard A, a total of 94,000 truck trips over the approximately eight year construction period might be required), rail transport is the preferred option for removing spoil from Yard A. If trucks were used to transport the rock from Yard A, the contractor would be required to use designated truck routes to the Long Island Expressway (LIE). Access from the site would be provided to best route the trucks to the LIE, while avoiding residential or heavily congested streets.

C. POSSIBLE IMPACTS OF THE PREFERRED ALTERNATIVE DURING CONSTRUCTION AND ASSOCIATED MITIGATION MEASURES

Since the No Action Alternative would not require new construction, no construction-related impacts would occur. The TSM Alternative would result in some disruption, but this would be relatively minor compared to the work required for the Preferred Alternative. The construction work related to the TSM Alternative would result in some noise, dust, and disruption near the Hunterspoint LIRR station and the affected portion of the LIE. Service at the LIRR station and subway station at Hunters Point Avenue could be affected for a short-time during off-peak hours. The TSM Alternative would also result in disruptions to traffic flows on the LIE while the required reconstruction work is underway, similar to the effects on any highway repaving or reconstruction project. Overall, however, impacts of the TSM Alternative during construction would be insignificant.

This section of the chapter describes the potential impacts associated with the Preferred Alternative. Where significant adverse impacts are identified, mitigation measures are also described. It should be noted that for each of the analysis areas considered below, the earlier chapter covering that subject (in Chapters 3 through 16) provides detailed information on the existing conditions and context against which to consider impacts.

LAND USE AND SOCIAL CONDITIONS

To consider the potential construction impacts of the Preferred Alternative, the land uses and social conditions in the immediate area of the Preferred Alternative were examined in detail. Zoning and land use policy are not addressed here, since the long-term plans and land use policies for the area are not particularly relevant to the short-term effects of a construction project. However, existing zoning and land use policies applicable to the broader study areas, along with a thorough discussion of land uses and social conditions in the broader study areas, are discussed in Chapter 3, "Land Use, Zoning, and Public Policy."

EXISTING LAND USE AND SOCIAL CONDITIONS NEAR PROJECT CONSTRUCTION AREAS

Manhattan

The area surrounding the project alignment in Manhattan is predominantly commercial south of 60th Street and predominantly residential to the north. Community facilities include several churches and synagogues, schools, and libraries. The area within approximately a block of the project alignment in Manhattan had a residential population of approximately 15,500 people in 1990, of whom some 12.7 percent were members of minorities (compared to 52 percent overall in Manhattan). This population includes the numerous homeless people who were counted at GCT itself during surveys conducted for the 1990 census. The 1989 median household income of this population was $47,276 (compared to $32,262 for all of Manhattan and $29,823 for New York City).

South of 60th Street: East Midtown. As described in Chapter 3, "Land Use, Zoning, and Public Policy," of this EIS, the area north of Grand Central Terminal along the project route is densely developed with office towers. Tall commercial buildings line most of Park Avenue, some extending the full blocks through to Madison and Lexington Avenues as well. Major non-commercial uses along this part of Park Avenue include St. Bartholomew's Church at 50th Street and the Racquet & Tennis Club, a private sports club at Park Avenue between 52nd and 53rd Streets. In addition, one of the city's most famous hotels, the Waldorf-Astoria, occupies the full block bounded by 49th and 50th Streets and Park and Lexington Avenues. Close to GCT, a large new commercial building is being constructed by Bear Stearns at 383 Madison Avenue between 45th and 46th Streets, above the westernmost tracks at GCT. Along Madison and Lexington Avenues, office buildings typically have ground-floor retail uses.

In addition to large commercial buildings, the midblocks between Madison and Park Avenues are occupied by a mix of smaller commercial buildings, ground-floor retail with residential apartments above, and hotels. Closest to GCT, uses include the Yale Club on Vanderbilt Avenue and the Roosevelt Hotel on East 45th Street. Community facilities in this area include St. Bartholomew's Church and Community House on Park Avenue at 50th Street (which is also a New York City Landmark) and Central Synagogue on Lexington Avenue at 55th Street.

Land Uses Adjacent to Construction Sites. Noticeable construction activities would be focused at or near Grand Central Terminal, a grand historic structure in the heart of the Midtown Manhattan commercial core. There are shops and restaurants at street level on all sides of the Grand Central Terminal superblock and on the blocks between Vanderbilt and Madison Avenues. In this area, Park Avenue is a wide boulevard divided by a landscaped median, and flanked by modern high-rise office towers. Under Option 1, extensive cut-and-cover construction would occur along four side streets just west and east of Park Avenue—East 52nd, 53rd, and 54th Streets between Park Avenue and Madison Avenue, and East 54th Street between Park and Lexington Avenues; as well as less extensive cut-and-cover along East 45th Street between Vanderbilt and Park Avenues. Option 2 would require extensive cut-and-cover work along one side street—East 55th Street, between Park and Madison Avenues—and less extensive cut-and-cover along East 49th and East 50th Streets, between Park and Madison Avenues. In addition, both engineering options would require small areas of cut-and-cover work for new entrances to the platforms and construction activity at 47 East 44th Street, where a new vent building would be constructed.

All of these blocks are dominated by office buildings and commercial uses. High-rise commercial towers line Park and Madison Avenues, while mid-rise office buildings and an occasional hotel occupy the lots between the avenues. There are only two residential buildings on these five blocks. Ground floor retail exists consistently on the Park and Madison Avenue corners, and sporadically along midblocks.

East 52nd Street between Park and Madison Avenues is lined on its southern side with office towers ranging from 24 to 30 stories tall. On the north side of the block at Park Avenue is the Racquet & Tennis Club, a private athletic club 5 stories high occupying the entire blockfront west of Park Avenue between 52nd and 53rd Streets. From the middle of the block, west to Madison Avenue, are three office buildings ranging in height from 7 to 40 stories. Ground-floor retail establishments exist from the middle of the block, west to Madison Avenue.

East 53rd Street between Park and Madison Avenues is similarly lined with office towers, with the exception of the Racquet & Tennis Club. On the south side of 53rd Street are two office buildings: one on the corner of Madison Avenue, 21 stories tall, and another that stretches across to 52nd Street, 40 stories tall. On the north side are 20- and 42-story tall office buildings, and the 21-story high Lever House Building at Park Avenue. The only ground-floor retail establishment on the block are at the bases of the two office towers along Madison Avenue.

East 53rd Street between Park and Lexington Avenues is slightly more mixed in character than the other blocks. On its south side is the 43-story Citibank building, spanning the entire block. On the north side of the block are low- and mid-rise office buildings, a hotel, and a 15-story residential building—one of only two residential buildings on these five blocks. Ground-floor retail is limited to the corners at Lexington Avenue, and at the base of the residential building.

East 54th Street between Park and Madison Avenues contains the other residential building in the area, a 5-story residence on the north side of the street. Also on the north side of the street is a 21-story office tower at 400 Park Avenue, a 36-story office tower at the corner of Madison Avenue, and an eight-story office building along with a restaurant in two 4-story buildings in the middle of the block. The south side of the block contains the Lever House at Park Avenue, a 25-story office tower at Madison Avenue, and a hotel between them.

East 55th Street between Park and Madison Avenues is completely lined with office buildings ranging from 17 to 33 stories tall, except for a 5-story private club in the middle of the north side of the block.

East 44th Street between Vanderbilt and Madison Avenues consists of tall buildings fronting on the avenues. The only exception to this pattern is the 5-story commercial building at 47 East 44th Street, which would be acquired for the Preferred Alternative. Land use in the area is predominantly commercial. The building at the corner of Vanderbilt Avenue and 44th Street, adjacent to 47 East 44th Street, is the 21-story Yale Club.

North of 60th Street: Upper East Side. The character of the area along the project alignment changes markedly north of 60th Street. Heading east from Park Avenue, the tunnels of the Preferred Alternative would pass beneath blocks between roughly 58th and 63rd Street before reaching the existing 63rd Street Tunnel at Second Avenue (see Chapter 2, "Project Alternatives," for maps of the alignment). Uses above the tunnel alignment above the project route are predominantly residential. Third and Second Avenues are lined by tall apartment buildings, but Lexington Avenue and the midblocks are typically lower density (3- to 5-story rowhouses). Along the 61st and 62nd Street midblocks between Second and Third Avenues is the Treadwell Farms Historic District, a group of row houses dating back to the 1870's. Along the 61st and 62nd Street midblocks, between Second and Third Avenues, lies the Treadwell Farms Historic District, a group of row houses dating back to the 1870's. Along Lexington, Third, and Second Avenues, most buildings have ground-floor retail uses. The Barbizon Hotel is also located along this part of Lexington Avenue, at the corner of 63rd Street. A prominent institution in this area is the Manhattan Eye, Ear and Throat Hospital, at the center of the block bounded by 63rd and 64th Streets and Second and Third Avenues. In addition, there are numerous small institutions (schools, libraries, churches, and synagogues) in this area. East of Second Avenue (approximately where the existing rail tunnel begins) uses continue to be primarily residential, but also include a Con Edison substation, a parking garage, a movie theater, and a health clinic.

Close to the project alignment, community facilities include several churches and synagogues, schools, and libraries. These include St. Bartholomew's Church and Community House on Park Avenue at 50th Street (which is also a New York City Landmark), Central Synagogue on Lexington Avenue at 55th Street, and the Manhattan Eye, Ear and Throat Hospital on 64th Street between Second and Third Avenues, as well as numerous smaller institutions in the portion of the project alignment north of 60th Street.

Roosevelt Island

The existing 63rd Street Tunnel passes beneath the center of Roosevelt Island, beneath the subway station there and the vacant Central Nurses Residence building. The existing tunnel vent building is located on the western shore of the island, between Main Street (the single road serving the island) and the East River, and is adjacent to a waterfront esplanade that curves around the vent building and the proposed construction site. The area close to the subway vent is otherwise predominantly vacant.

Queens Tunnel Alignment and Sunnyside Yard/Yard A/Harold Interlocking

In Queens, the existing 63rd Street Tunnel travels along 41st Avenue, passing beneath Queensbridge Park, a 20-acre park along the East River just north of the Queensboro Bridge, and continuing beneath the Queensbridge Houses public housing complex. East of 21st Street, uses become more varied but are largely light industry, storage, and auto-related, including surface parking lots. Scattered residential development generally consists of older 2-story brick and frame homes and a few small to medium apartment buildings.

Closer to Northern Boulevard along the tunnel route is a concentration of commercial uses including banking and office space, clustered near Queens Plaza. A public high school, which includes the Academy of American Studies and the Newcomer High School, is at 41st Avenue between 28th and 29th Streets. Construction work taking place on the block bounded by 40th Road, 41st Avenue and Northern Boulevard related to MTA New York City Transit's 63rd Street Tunnel Connector Project has been under way for a number of years.

As described in Chapter 3, the Yard A/Sunnyside Yard railroad complex occupies a large area that is predominantly separated from the surrounding neighborhood by grade changes, fences, and bulky industrial buildings. Surrounding the yards, land use is overwhelmingly industrial and commercial, with auto-related uses as well (including car dealerships along Northern Boulevard east of Queens Plaza).The area is further characterized by a network of transportation structures that include the streets passing over the rail yard, elevated subway tracks on Queens Boulevard and Northern Boulevard, and the approach to the Queensboro Bridge that runs above Queens Plaza.

Exceptions to the industrial and commercial pattern include several residences along 38th Avenue and 32nd Street near Northern Boulevard, a church and center for mentally challenged adults, both on 39th Avenue, and a large Korean Presbyterian Church in a new building adjacent to the yards at 37th Avenue. East of Queens Plaza, some office uses are focused around Court House Square. In addition, south of the yards, LaGuardia Community College is located in a large formerly industrial building on Thomson Avenue, while residential uses are also located in the area south of Skillman Avenue, including several apartment buildings and two-story houses. The north side of Skillman Avenue, along the south side of the rail yard between 43rd and 39th Streets, is industrial with the exception of a public playground and a small church.

At the eastern end of Sunnyside Yard, Harold Interlocking continues on an elevated embankment eastward alongside Barnett Avenue. The north side of Barnett Avenue, adjacent to the railroad tracks, is lined by auto-related and industrial uses, including 20 privately owned residential garages. The south side of Barnett Avenue marks the beginning of the Sunnyside Gardens residential neighborhood, a multi-block complex of low-rise residences designated as a historic district.

Although it is predominantly industrial in character, because of its large size the area close to the project alignment is home to approximately 22,000 people (according to the 1990 census). Most of these residents are at the edges of the area, either near the East River in the northwestern part of the alignment or near Sunnyside Gardens in the southeastern portion. More than half of this population (52 percent) consists of minorities. The 1989 median household income of this population was $21,996 (compared to $34,186 for Queens and $29,823 for New York City as a whole).

Yards

As described in Chapter 3, land use around Blissville and Maspeth Yards is predominantly industrial, with the exception of a small residential neighborhood across from a portion of Maspeth Yard. The area around Fresh Pond Yard is predominantly residential, but a buffer of industrial and commercial buildings almost completely separates the yard from the residential uses. Mafera Park, a New York City Park, also abuts a small corner of Fresh Pond Yard. Highbridge

Yard is separated from the nearest residential uses by grade changes and the Harlem River and Major Deegan Expressway.

POSSIBLE IMPACTS DURING CONSTRUCTION

Construction of the Preferred Alternative would result in disruptions and inconveniences in areas near the construction sites. Considering the size and scope of the project, however, the disruption would be quite limited. Most of the work would occur either underground, with limited or no activity at the surface or in public areas, or in railroad yards that are separated from surrounding uses. Disruptions would occur near Grand Central Terminal in Manhattan, and near Northern Boulevard and Barnett Avenue in Queens. Under Option 1 in Manhattan, extensive cut-and-cover construction work would be required at 52nd, 53rd, and 54th Streets.

Manhattan

Option 1. Most of the work in Manhattan would be related to construction of the new tunnels deep beneath the surface. This would not be perceptible at the surface, except for some possible ground-borne noise during the few weeks of construction directly under some buildings (see the discussion below under "Vibration").

The cut-and-cover work near Park Avenue in the 40's and 50's would be disruptive to surrounding land uses, however. These uses are predominantly commercial, but do include some residential and hotel uses, as described above and in Chapter 3, "Land Use, Zoning, and Public Policy." The anticipated sources of disturbance would include dust, noise, and vibration during surface excavation; storage and handling of construction materials; and temporary reductions in sidewalk width, traffic lanes, and curbside parking. Construction of the ventilation facility at 47 East 44th Street would cause similar disturbance to surrounding uses, but would not reduce traffic lanes or affect curbside parking. (Specific information about effects on traffic, noise, and vibration is provided later in this chapter.)

Option 2. For Option 2, an even greater portion of construction would occur well beneath the surface, with no impacts at the street level. Work at street entrances would be similar to Option 1, as would work in front of 47 East 44th Street. In addition, some excavation would be required for the ventilation grates on 49th and 50th Streets for the GCT ventilation facility. The only extensive cut-and-cover work would occur at 55th Street.

Queens Alignment/Sunnyside Yard/Yard A/Harold Interlocking

Most of the work along the Queens alignment and in the railroad yard complex would be buffered from surrounding uses. Work in the existing 63rd Street Tunnel would not be perceptible at the surface, except for some possible ground-borne noise (see "Vibration," below).

Construction activities on either side of Northern Boulevard at 41st Avenue (near Queens Plaza) would in effect continue the construction activities that have been ongoing there for the 63rd Street Connector Project. The construction site being used for that project would also be used for East Side Access. This would cause some disruption (principally noise and also some vibration) at the Newcomer High School at 28-01 41st Avenue, adjacent to the site.

Construction of the new Sunnyside station is not likely to disrupt surrounding land uses which are predominantly industrial. Much of the construction activity would take place in the yard and would not be visible from the street level. Most material and equipment would be delivered to the site either by rail or through street access from Skillman Avenue. Some work would involve using the eastbound curb lane and sidewalk on the Queens Boulevard bridge for short periods of time during off-peak periods.

At the Harold Interlocking between 43rd and 48th Streets, just east of Sunnyside Yard, the Preferred Alternative might require acquisition of private property along the north side of Barnett Avenue (see Chapter 5, "Economic Conditions," for a discussion of displacement and relocation). If this occurs, the project would demolish the structures along the north side of Barnett Avenue to use the land as a construction staging area. Replacement of these structures with a construction staging area would result in temporary disruptions—primarily noise, vibration, and dust—to nearby residents. The work to create this viaduct would last approximately 1 year.

Yards

The construction activities proposed at Blissville or Maspeth Yard, Fresh Pond Yard, and Highbridge Yard are relatively minor. Considering that uses immediate to Blissville and Maspeth, are predominantly industrial, this work would cause little to no disruption to surrounding uses. While there are residences in the immediate vicinity of Fresh Pond Yard, a buffer of industrial uses lies between these residences and the potential construction site in the yard, so work is not likely to disrupt surrounding uses.

ECONOMIC CONDITIONS AND RELOCATION

Implementation of the Preferred Alternative would generate economic activity throughout the construction period. At the same time, it would also introduce the potential for adverse impacts on businesses near the construction sites, as described below.

PROBABLE ECONOMIC AND FISCAL IMPACTS

Economic Benefits During the Construction Period

Construction of the proposed project would generate economic benefits for New York City and New York State, particularly from the creation of construction jobs and wages and salaries paid to construction workers, as well as indirect economic activity generated from the direct expenditures throughout the regional economy (often referred to as the "ripple" or "multiplier" effect). With an estimated construction cost of approximately $4.71 billion, Option 1 would generate significant economic benefits. Option 2, with costs of approximately $4.34 billion, would have slightly fewer construction costs and economic benefits than Option 1.*

As a result of direct expenditures, the direct employment from construction activities in both Option 1 and Option 2 would be an estimated 14,200 person-years.** In addition to employment directly attributable to construction of the proposed project, indirect employment would occur from the construction expenditures, including jobs in business establishments providing goods and services to the contractors, as well as in businesses that would provide goods and services to construction workers. Secondary employment from both options is expected to be considerable. While no specific effort is made here to quantify such indirect and induced benefits, it is universally accepted that investments of this magnitude in major transportation infrastructure projects would result in tens of thousands of induced jobs throughout the regional and national economy.

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* Construction costs include hard and soft construction costs, engineering, management, rolling stock, real estate, escalation, and contingency and have been escalated to the midpoint year of construction.

** A person-year is the equivalent of one employee working full-time for 1 year. Person-years are estimated by East Side Access Project, Program Manager.

Employment from the project will be concentrated at the peak of construction, between the years 2004 and 2010, when nearly 90 percent of construction period employment will occur.

POTENTIAL ADVERSE ECONOMIC EFFECTS DURING CONSTRUCTION

Economic Effects due to Disruption

In areas adjacent to particularly disruptive construction activities, economic conditions could be affected. In particular, this could occur near the cut-and-cover areas in Manhattan. Around other construction areas, including the work in Queens and at Blissville or Maspeth Yard, Fresh Pond Yard, and Highbridge Yard, construction activities would be largely contained on the construction sites and no adverse effects on economic conditions would be expected.

The disturbance associated with the extensive cut-and-cover construction required in Manhattan could affect economic conditions of businesses nearby. The anticipated sources of disturbance would include dust, noise, and vibration during surface excavation; storage and handling of construction materials; and temporary reductions in sidewalk width, traffic lanes, and curbside parking. The effects would be substantially worse under Option 1 than under Option 2. Effects could be expected on pedestrian and shopping patterns, even for a temporary period of time. Real or perceived changes to the physical environment—including narrower sidewalks areas that impede and constrain pedestrian flow, especially for shoppers with large bags or carts; uneven sidewalks or slippery plates; or removal of curbside parking that acts as a safety buffer between pedestrian and vehicular traffic—may divert pedestrians and shoppers from their typical patterns. In addition, elimination of parking lanes and reduction in the number of through lanes are likely to make deliveries to stores and businesses more difficult. Additional time may be required to load and unload trucks, probably resulting in an increase in the retailers' operating expenses. Possible economic impacts could occur to businesses in these construction areas, particularly those that may be marginal. This depends not only on the construction activities, but also on the type and size of businesses in the construction zone. Smaller retailers—particularly those that have competitors nearby (for example, deli, grocery, and fruit markets)—may lose customers who might prefer to shop in a quieter and more comfortable environment.

Displacement and Relocation

As described in Chapter 5, acquisition of private property is required for construction of the Preferred Alternative. Private property is required in Manhattan for some of the new entrances to GCT, and in Queens for improvements to Harold Interlocking. In addition, permanent subsurface easements are required beneath a number of properties in Manhattan, to allow the tunnel to travel from the existing 63rd Street Tunnel to GCT. These acquisitions would occur during construction, and most would be permanent. As detailed in Chapter 5, the rights of owners and tenants of real property acquired to implement the proposed project, including permanent easements, are protected under the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, as amended (the Uniform Act). The Uniform Act provides for equitable treatment of persons displaced from their homes, businesses or farms by federal and federally assisted programs. It also establishes uniform and equitable land acquisition procedures. Entitlements for property owners under the law include the following:

- Just compensation for property, which may not be less than the acquiring agency's approved appraisal of the fair market value;
- Determination of just compensation by a court of law;
- The opportunity to accompany the appraiser who appraises their property;
- Written statement of, and summary of the basis for the amount established by the acquiring agency as just compensation;
- Payment of the agreed upon purchase price (or a deposit in the court) before being required to surrender possession of the property;
- Reimbursement for certain expenses incidental to transfer of title to the acquiring agency;
- Reimbursement for certain litigation expenses;
- At least 90 days' written notice to vacate occupied property;
- Relocation services and payments, where applicable; these may involve housing supplements, moving cost, etc. for residential acquisitions, or reestablishment, moving costs, etc. for business, nonprofit, or farm acquisitions; and
- Written statement or brochure advising property owners of their rights and entitlements, and assurance that they receive all of the services and payments to which they are entitled under federal and state law and regulations.

In addition to those properties permanently acquired for the project, Option 1 of the Preferred Alternative would require temporary use of private property during the construction period. Specifically, Option 1 would require the use of basements in four private properties—the Racquet & Tennis Club, Lever House, 400 Park Avenue, and 410 Park Avenue. The work in these properties would last approximately two years at each property. During that time, the existing uses in those basements would be displaced. After construction is complete, the basement spaces would be returned to the property owners. Affected uses are as follows:

- Racquet & Tennis Club (370 Park Avenue): In this building, Option 1's construction activities would require use of a lunchroom, storage space, and a bathroom currently used by a tenant, American Express; a locker room used by Racquet & Tennis Club members; and a third space currently used by a tenant, Bank of New York.
- Lever House (390 Park Avenue): Construction activities associated with Option 1 would require use of the 200-space parking garage in the basement of that building and a 40-foot by 40-foot space. The garage is currently operated by Kinney Parking.
- 400 Park Avenue: Option 1 would require the use of a 5,000-square-foot basement storage space used by a tenant, Syms clothing store.
- 410 Park Avenue: In 410 Park Avenue, a space currently used as an elevator machine room in a sub-basement would be used. There is a possibility that construction in 410 Park Avenue could take one elevator at a time out of service for the duration of construction.

In Queens, in addition to the permanent acquisition of a portion or all of the commercial building at 3856-3864 43rd Street, property might be required along the Harold Interlocking, between 43rd and 48th Streets. The private property on the north side of Barnett Avenue, including private garages and some small businesses, might be acquired to allow space for construction staging. This property would not be required after construction in this area is complete.

VISUAL AND AESTHETIC CONSIDERATIONS

Most of the construction work required for the Preferred Alternative would occur in areas not accessible to the public. These areas are also, for the most part, not visible to the public.

MANHATTAN

In Manhattan, the cut-and-cover work associated with the ventilation plants and building underpinning would clearly be visible to the public in its early stages. During the first approximately two months, these locations would be open excavation areas surrounded by plywood fencing. Construction equipment would likely be visible behind the fences. Traffic and pedestrian patterns would be diverted as well. Overall, this work would not be greatly different from construction activities that typically occur throughout Manhattan, where pedestrian walkways and construction equipment are not uncommon. Once the excavation areas are covered with concrete decking panels, construction would be less visible at street level. However, there would still be areas of the sidewalk and street used by contractors as construction staging areas.

The work in GCT and related to the new street entrances to the terminal would be closed off from the public by construction walls made of plywood fencing. Consequently, while the public might be aware that construction was under way, the construction activities themselves would not be visible. The work to excavate an approximately 30-foot deep area at 47 East 44th Street would similarly be shielded from public view. However, as is typical for construction of buildings in Manhattan, the site would be used as a construction staging area prior to actual construction. Trucks entering and leaving the site would be visible, as would construction equipment on the site. While a plywood wall would block direct views from the sidewalk into the site, once the first story of the building was complete, it would be visible both from the sidewalk and from surrounding buildings.

ROOSEVELT ISLAND

The work on Roosevelt Island associated with the new underground substation enclosure would be minor and short-term. The construction area would be surrounded by a fence during that time.

QUEENS ALIGNMENT/SUNNYSIDE YARD/YARD A/HAROLD INTERLOCKING

Although extensive construction activities would occur in Queens, most of this work would not be visible to the public. All of the work within Yard A and Sunnyside Yard would be largely invisible, since those yards are separated from surrounding neighborhoods by grade changes, fences, and bulky industrial buildings. Most work outside the yards would be enclosed by fencing, limiting views of the construction materials and equipment. Construction activities that would be most visible in Queens are the new Sunnyside Station and the Harold Interlocking work between 43rd and 48th Streets.

Construction activities at Northern Boulevard and 41st Avenue (on the current construction site for the 63rd Street Tunnel Connector Project) and across Northern Boulevard at 2950-2970 Northern Boulevard would be enclosed by high fencing, to limit visual disruption to the area.

Efforts would be made to work with the community to safeguard against complaints about dust, noise, traffic and aesthetics during construction of the Preferred Alternative.

Some parts of the new Sunnyside station would be highly visible during construction, because of its location on and adjacent to the Queens Boulevard bridge. These elements would include the "headhouse" which would open onto Queens Boulevard and the elevated pedestrian walkways connecting to the platforms below. However, these construction elements would not significantly affect the visual character of the area, which consists of a bridge with an elevated subway over an active rail yard in an industrial area.

At the Harold Interlocking between 43rd and 48th Streets, just east of Sunnyside Yard, the Preferred Alternative might require permanent acquisition of a private property north of the proposed viaduct, at 3856-3864 43rd Street. The Preferred Alternative may also require acquisition of private property along the north side of Barnett Avenue (see Chapter 5 for a discussion of displacement and relocation). If this occurs, the project would demolish the structures along the north side of Barnett Avenue to use the land as a construction staging area. During construction, a temporary visual/noise barrier would be erected to protect residences across Barnett Avenue. After construction, the demolished structures would be replaced in kind.

YARDS

The construction activities required at either Blissville or Maspeth Yard would be minor in extent and duration, and would not result in significant visual changes from the existing conditions at either of those yards. At Fresh Pond Yard, the limited construction activity associated with building a new structure in the center of the yard would not result in significant visual changes, either.

While the work required at Highbridge Yard would be extensive, the yard is separated from other uses and potential viewers by grade changes and distance. Drivers on the Major Deegan Expressway and residents of apartment buildings some distance from the yard would be able to see the construction activities. This would not result in significant visual impacts during construction.

HISTORIC RESOURCES

Construction activities associated with the Preferred Alternative would take place beneath several historic resources in Manhattan. The tunneling work would be performed to limit vibrations, so that no damage would occur to historic resources above the construction sites (see the discussion under "Vibration," below). The Preferred Alternative would also involve physical alterations to historic structures in Manhattan. In Option 1, three historic resources would be physically altered—Grand Central Terminal, the Racquet & Tennis Club, and Lever House. In Option 2, one historic resource, Grand Central Terminal, would be altered. The project would alter some of the public as well as nonpublic spaces in GCT, and the Preferred Alternative's Option 1 would require underpinning of the Racquet & Tennis Club and Lever House. Both options would also involve construction activities adjacent to the Yale Club, which is also a historic resource. (See Chapter 7, "Historic Resources," for a detailed discussion of historic resources.) To avoid damage to these historic structures, a construction protection plan would be developed and implemented in consultation with the State Historic Preservation Office (SHPO) at the New York State Office of Parks, Recreation and Historic Preservation during the project's ongoing consultation with that agency.

In Queens, construction in the Sunnyside Yard/Yard A railyard complex would occur near two historic railroad structures, Switch Tower Q and former Signal Cabin F. These structures would also be included in the construction protection plan to be approved by SHPO prior to the start of construction. A Memorandum of Agreement and/or Programmatic Agreement would be executed by MTA/LIRR, SHPO, and, if necessary, the Advisory Council on Historic Preservation, outlining the process and measures to be undertaken to avoid any significant adverse impacts to archaeological resources. MTA's transportation facilities are exempt from local laws and ordinances pursuant to Public Authorities Law Section 1266, Subdivision 8. The MTA nevertheless intends to continue to seek the advice and counsel of the New York City Landmarks Preservation Commission (LPC) as it goes forward in the same manner as it has in the past. As MTA's plans develop, MTA anticipates that it will submit to LPC information regarding the project, and would expect that LPC, if it so chooses, would hold a public hearing and issue a report on the MTA's plans in the manner that LPC issues reports with respect to city-owned properties.

ARCHAEOLOGICAL RESOURCES

As described in Chapter 8, "Archaeological Resources," there is a possibility that some of the sites to be affected by the Preferred Alternative may contain buried archaeological resources. If any resources are present on project sites, they could be disturbed by construction activities for the Preferred Alternative. To avoid significant adverse impacts on archaeological resources, additional work will be performed in consultation with SHPO where the potential for archaeological resources has been identified. Once preliminary engineering is under way and the locations of the proposed construction activities have been fully defined, continuous tube soil borings would be performed in all locations identified as potentially significant (where soil borings have not already been completed and analyzed for the EIS analysis). The results of the borings would be used to determine depths of fill, to better understand the sensitivity of the areas to be affected by the project. The potential for impacts would then be re-evaluated. For any significant adverse impacts identified, appropriate mitigation measures would be developed through ongoing consultation with SHPO, so that no adverse impact would occur. Mitigation measures may include subsurface archaeological testing to locate and identify archaeological features, assessment of eligibility for the National Register, and, if appropriate, data recovery in the form of a full-scale excavation. A Memorandum of Agreement and/or Programmatic Agreement would be executed by MTA/LIRR, SHPO, and, if necessary, the Advisory Council on Historic Preservation, outlining the process and measures to be undertaken to avoid any significant adverse impacts to archaeological resources.

TRANSPORTATION

During construction, the Preferred Alternative has the potential to significantly affect several components of the area's transportation system. Most notable would be the effects of construction on Metro-North Railroad's operations due to work in GCT as well as along the Park Avenue tunnel from 52nd to 56th Streets (Option 1 only); disruption to street and pedestrian traffic due to cut-and-cover construction at several midblock locations in Midtown; operational effects on NYCT subway especially due to the cut-and-cover construction across Northern Boulevard in Queens; and the effects of work within the Harold Interlocking on Amtrak and NJ Transit operations.

COMMUTER RAIL

Effects on Metro-North Railroad

Metro-North Tracks from 52nd to 56th Street—Option 1. The underpinning of the four buildings on the west side of Park Avenue between 52nd and 55th Streets would require closing of some MNR tracks in this area during the construction of Option 1 only. In addition, in order to construct the new LIRR tunnel underneath the existing MNR structure between 54th and 56th Streets, some disruption to MNR operations would be required. As discussed previously, the work in this area would consist of soil stabilization and the underpinning of the existing columns supporting the MNR tracks.

North of approximately 57th Street, the Metro-North tunnel consists of four tracks. As the tunnel approaches GCT these four tracks split into a number of throat tracks (lettered A through J) which enable trains to access all of the upper- and lower-level platforms in GCT. This occurs from approximately 57th to 50th Street, where three throat tracks (B, F, and J) provide access to lower-level platforms, Madison Yard, and the East Storage Yard; and six throat tracks (C, D, E, G, H, and I) provide access to upper-level platforms. (Track A is stub-ended and no longer used as a throat track.)

The westernmost throat track, Track J, would be taken out of service while adjacent LIRR tunnels are constructed under Park Avenue buildings, and while the soil below is supported in preparation for new tunnels to run underneath it. This combined service outage would last a total of approximately 3½ years (from late 2003 to late 2006).

The temporary closure of Track J to facilitate construction of new LIRR tunnels would not cause a significant adverse impact on normal Metro-North service. Prior to Track J's decommissioning, a number of tracks and platforms within GCT that are served by Track J would be taken out of service. These tracks include Madison Yard Tracks, East Yard Tracks, and Metro-North revenue tracks 114-117. This significantly reduces the need to use Track J as a throat track for GCT's lower level. Other lower level tracks served by Track J that are not being taken out of service, including tracks 101-113, would still be served by Metro-North throat tracks C and F, providing sufficient capacity to preserve Metro-North service during normal operations. However, Metro-North's ability to recover from operational incidences would be seriously affected.

Combined with the track outage on Track J would be track outages on tracks F, G, H, and I to permit the construction of the temporary support structures required for the new tunnels to proceed underneath the existing MNR tracks. Tracks F and G would have to be taken out of service continuously for three months each. Tracks H and I would have to be taken out of service during off-peak hours and weekends for a longer period of time, as discussed below. In addition, within the same timeframe, an adjacent track to the track being supported (either F, G, H, or I) would be taken out of service for between five and eight weekends, depending on the particular track outage location.

Since service to the lower level of GCT is provided only by tracks B, F and J, and Metro-North could not operate its weekday service via a single track to the lower level, tracks F and J would not be taken out of service at the same time. Either the work near track F would have to precede (without overlap) the Track J outage requirement or occur only during the weekend when no service to the lower level of GCT is provided. If the latter were the case, the work near Track F would take approximately 30 weekends (or eight months) to complete. Outages on track B would not be required.

Track G would be taken out of service continuously for a period of three months without adversely affecting Metro-North's operations to the upper level of GCT. Since simultaneous track outages on Track H and I would prevent access to Ladder Track X and cause single-tracking on Ladder Track Y (adversely affecting service to west side platforms [34-42] during the peak period), these tracks would only be taken out of service one at a time during off-peak hours and weekends. This off-peak and weekend work would require a combined total of approximately one year to complete.

Soil stabilization efforts between 55th and 56th Streets would be completed concurrent to the construction of the temporary support structure and utilize the same track outages on tracks F, G, H, and I as described above. Prior to soil stabilization under MNR tracks, express cable runs, local cables, track circuits and other railroad utilities would need to be relocated. Additional track outages would follow on Track C for a period of one month, and Tracks D and E for subsequent periods of three months each. Tracks C, D, and E along with G, H, and I lead to MNR's upper level tracks.

The track outage required for Track C would not restrict access to Ladder Track K which provides a critical connection to Ladder Track M (preventing single-tracking the east side of the upper level on Ladder Track O). Therefore, Track C would be taken out of service for a continuous 1-month period without adversely affecting service to the 10 platforms (tracks 11-21) and the east side yards. Tracks D and E could be taken out of service continuously for a period of 3 months each without adversely affecting MNR's operations to the upper level of GCT.

To summarize, during the peak period, up to two tracks would be out of service continuously and at the same time: Track J servicing the lower level of GCT and either Tracks C, D, E, or G servicing the upper level of GCT. During off-peak hours and weekends, up to three tracks would be out of service at one time. Tracks H and I would be taken out of service only during off-peak hours and weekends and Track F would be taken out of service only during the weekends.

While the construction activities associated with the Preferred Alternative's Option 1 would be performed without reducing future planned service levels on the Harlem, Hudson, and New Haven lines, they would nevertheless temporarily adversely impact MNR service. Schedule resiliency, or the ability of the system to absorb delay, and the recoverability of the railroad in the event of equipment failure or another operational incident would be adversely affected for as long as the track outages are required. As a result, MNR's on-time performance would be expected to deteriorate. In addition, the ability of MNR to perform routine track work and infrastructure maintenance without requiring service changes or reductions would be adversely affected.

Measures to minimize prolonged service disruptions on the Harlem, Hudson, and New Haven lines resulting from the track outage requirements of Option 1 would include reducing the number of tracks taken out of service during peak periods and sequencing track outages to maximize the efficient completion of construction tasks. Different track outage plans would be developed to reduce the potential to cause MNR service disruptions, while maximizing the number of working hours to shorten the construction period. The optimum solution would be determined with the help of a simulation model to test the effects of delays and equipment failures under a variety of track outage schemes.

Metro-North Tracks from 52nd to 56th Street—Option 2. Construction of Option 2 would not require any changes in MNR service in this vicinity.

GCT Lower Level—Option 1. Option 1 would require the removal of MNR's revenue tracks 114, 115 and 116 as well as storage tracks 117 to 125. However, before construction activities can begin in this area, MNR storage capacity of the East Yard on the lower level of GCT would be restored. Once these tracks are available for MNR use, the lower level terminal area west of Track 113 would be available for construction of the Preferred Alternative.

After providing replacement space for MNR trains, one of the first steps in the construction process for the lower level would involve the relocation, underpinning, or removal of existing structural columns as well as the relocation of track 113. This work would affect MNR operations on the upper level. The general sequence of work, which would proceed in a westerly direction, would be to take two MNR tracks and the island platform on the upper level out of service while the structural reframing on the lower level proceeds. The general sequence would be to perform the construction in three stages. Stage 1 would involve upper level tracks 32/33 and platform P, while Stage 2 would involve tracks 34/35 with platform Q and Stage 3 would involve tracks 36/37 and platform R.

Each stage would take approximately six months. To minimize the overall impacts on MNR operations, the reconstruction of platform P for the off- street entrance at 45th Street as well as the new stair to the 47th Street cross passageway would be constructed concurrently. The 47th Street cross passageway would remain in service but the stair leading to the upper level platform would be taken out of service in conjunction with the platform itself.

The relocation of columns on the lower level at the north and south interlockings would require taking out of service tracks 38 to 42 and platforms S, T, and U at various times. No more than two tracks would be taken out of service at any given time. Track 38 to 39 and platform S would be taken out of service for a 6-month period, continuously and concurrently with the work rebuilding the upper-level track structure for the cross passageways. Next, tracks 39 and 40 and platform T would be taken out of service continuously for another six months. Finally, tracks 41 and 42 and platform U would be taken out of service continuously for a period of approximately 8 months.

As for the underpinning of Metro-North tracks in the vicinity of 55th Street, discussed above, the construction activities associated with the underpinning of Metro-North columns in GCT under Option 1 would be performed without reducing future planned service levels on the Harlem, Hudson, and New Haven lines. However, they would nevertheless adversely impact MNR service in the areas of schedule resiliency and the recoverability.

GCT Lower Level—Option 2. The work for Option 2 would be less extensive than what is required for Option 1 and would not require relocating, underpinning or removing existing structural columns, or relocating track 113. To avoid underpinning MNR columns, ventilation and vertical circulation shafts would be excavated between existing columns. Similarly, construction of Option 2 would not affect upper-level revenue tracks. Most of the work in the lower level of GCT would involve removing existing tracks and constructing a concrete platform to form the mezzanine. However, in order to construct the 48th Street entrance, the stub-ended work train tracks 94 and 95 would need to be shortened.

Closure of Loop Track—Option 1. During excavation for and construction of the new lower level loop track between 43rd Street and 47th Street (a component of Option 1 only), one storage track (track 3) in the upper level of GCT would be taken out of service. Since MNR would still have sufficient storage capacity, this service outage would not have an adverse impact on operations of MNR.

Effects on LIRR Service

Some of the construction work at Harold Interlocking is likely to require the rerouting of some LIRR trains, either within the track complex at the interlocking itself or elsewhere. Specific service plans would be developed in conjunction with the formulation of construction staging plans. A chief objective of the construction staging plans would be to minimize dislocations to LIRR service.

The LIRR successfully managed service adjustments during a major capital project that rebuilt much of Harold Interlocking serval years ago. The same kind of planning would be employed to accommodate construction for the Preferred Alternative of East Side Access.

Effects on Amtrak and NJ Transit

While Amtrak would be operating on different tracks during construction of the Preferred Alternative, this would not prevent it from achieving existing and projected levels of service through Harold Interlocking.

Currently, neither NJ Transit nor Amtrak are required to go through Harold Interlocking to access storage tracks at Sunnyside Yard. Construction in the vicinity of the yard would be staged so that all operations at the yard could continue undiminished. Access by NJ Transit and Amtrak to Sunnyside Yard via a minimum of two loop tracks would be maintained during construction of the tunnels under the yard and during work at Harold Interlocking.

While cut-and-cover work is occurring in Yard A, a temporary track would be provided to Amtrak to facilitate access to their new high-speed rail service and inspection (S&I) shop. While the location of this track may shift during the course of Yard A work, Amtrak would have continuous access to the S&I shop. In addition, the temporary relocation of track for Amtrak access of Sunnyside Yard from the Hellgate line would be provided throughout the construction period. Amtrak plans to demolish Buildings 2, 3, and 4 in Sunnyside Yard and construct a new facility to house their maintenance and yard personnel. However, the proposed tunnel construction would require the relocating of these personnel before the new Amtrak facility is completed. Therefore, it would be necessary to provide displaced Amtrak personnel with a temporary space until their new facility is complete.

SUBWAYS

Manhattan

In Manhattan, a number of subway lines cross or come in close proximity to the alignment of the Preferred Alternative. The Option 1 alignment would pass both above and below the E and F subway lines at 53rd Street, below the N and R lines at 60th Street, and below the 4, 5, and 6 lines at Lexington Avenue and approximately 61st Street. The Option 2 alignment would pass well below (more than 25 feet) all of the above subway lines in Manhattan. The alignment for both options would connect to the lower level of the existing 63rd Street Tunnel at Second Avenue, just below the subway lines that use that currently use the upper level of the tunnel (traditionally the B and Q; currently the Shuttle).

In Option 1, support for the subway lines may be required. The installation of the support system would require outages during off-peak hours. In addition, the alignment would require the reconstruction of the NYCT 53rd Street ventilation facility. Outages to the E and F train in off-peak hours may be required to construct the vent plant.

No impact on NYCT operations is expected under Option 2.

Queens

The alignment for the Preferred Alternative in Queens crosses under both underground and elevated subway lines as it passes beneath Northern Boulevard. Two trains that make local stops in Queens, the G and the R, run under Northern Boulevard as they cross the alignment at approximately 41st Avenue. Two trains that make express stops in Queens, the E and the F, also run under Northern Boulevard. All four trains stop at the Queens Plaza express stop, just south of the alignment, and at the Jackson Heights/Roosevelt Avenue stop, approximately three miles east of the alignment. In between, the G and the R trains make five local stops, about every eight blocks. The Astoria line N train operates on a viaduct above Northern Boulevard. The N train provides local service to Northern Queens.

The operations of these subway lines under and over Northern Boulevard would be impacted during underpinning and construction of the bathtub's jet grout walls and piles along the alignment, in the area just north of Queens Plaza. Service disruptions would be expected on the G, R, E, and F trains between Queens Plaza and Roosevelt Avenue express stops during nights and weekends only.

Four tracks, two in each direction, currently serve both express (E and F) trains and local (G and R) trains between Queens Plaza and Roosevelt Avenue. Over an approximately three-month period, for the installation of the jet grout walls, up to two tracks would need to be taken out of service during weekday nights (between 11 PM and 5 AM) and on weekends (from 11 PM Friday to 5 AM Monday). The three month time period allotted for this work assumes that track outages would be allowed every weekend without interruption. Following the installation of the jet grout walls, the bathtub cut-off walls would be constructed. No track outages would be required for this work which would take approximately six months to complete. The installation of the piles to support the NYCT subway structure would follow the construction of the bathtub. Again, up to two tracks would be taken out of service during weekday nights and on weekends for approximately 2 months.

Train reroutings and their effects on NYCT customers would be as follows:

- The westbound local line would be rerouted to the westbound express line and the eastbound express line would be rerouted to the eastbound local line. Since no local westbound service would be provided between Roosevelt Avenue and Queens Boulevard, customers wanting to get off at 36th Street, Steinway Street, 46th Street, Northern Boulevard, or 65th Street would bypass their local stop, detrain at Queens Plaza, and backtrack on the eastbound local to their destination. Customers at those local stops wanting to board a westbound train would have to take the eastbound local to Roosevelt Avenue where they would connect with the westbound express. Travel between the local stops would require two transfers.

- The eastbound local line would be rerouted to the eastbound express line and the westbound express line would be rerouted to the westbound local line. The same service disruption as described above would occur, in the reverse direction of travel.

VEHICULAR TRAFFIC AND PARKING

The Preferred Alternative would require closing sidewalks and vehicular traffic lanes, in some cases for short durations and in other cases for longer durations, and could cause changes to vehicular traffic patterns in the vicinity of traffic lane closures.

Manhattan

In Manhattan, for Option 1, portions of the street and sidewalk would need to be closed for the cut-and-cover work on 52nd, 53rd, and 54th Streets (for underpinning work done at 370, 390, 400, and 410 Park Avenue; for tunnel access; for ventilation plant utility relocations; and for ventilation plant construction) and at 44th through 48th Streets (for construction of new LIRR entrances and passageways to GCT).

Option 2 would require similar construction between 44th and 48th Streets for new entrances but would only require a ventilation plant at 55th Street, which would be built mostly from the mined tunnels below.

52nd Street. For underpinning work at the Racquet & Tennis Club, the sidewalk and the curb lane along the north side of 52nd Street would need to be closed 24 hours per day for about two years. The sidewalk closure would extend for about 60 feet west of Park Avenue; the curb lane closure would extend for about 150 feet to accommodate cranes and other construction work zone material as well as a temporary walkway around the construction zone for pedestrians.

The middle lane of 52nd Street would also be used intermittently by delivery vehicles loading and unloading materials at the construction zone. It is anticipated that the use of this middle lane (i.e., the travel lane) by construction-related vehicles could be restricted to off-peak hours. Therefore, to avoid effectively closing the street, parking would need to be prohibited along both curbs during working periods for about 150 feet west of Park Avenue.

No parking regulation changes are required on the north curb since parking regulations are currently "No Standing Anytime." However, to mitigate potential traffic impacts during construction, parking regulations on the south curb would need to change from "No Standing Except Trucks Loading and Unloading, 7 AM to 7 PM, Except Sunday," to "No Standing Anytime." In addition, deliveries would be precluded on that side of 52nd Street. Approximately seven curb parking spaces would be lost. However, access would still need to be maintained to the one truck loading bay at 40 East 52nd Street (south side of the street).

53rd Street. For underpinning work at the Racquet & Tennis Club and Lever House, both sidewalks and both curb lanes would need to be closed 24 hours per day for a two-year period. The sidewalk closure would extend for about 60 feet west of Park Avenue; the curb lane closures would extend for about 150 feet, including provision for a temporary pedestrian walkway around the construction zone.

The middle lane of 53rd Street would also be used intermittently by construction-related delivery vehicles, although these activities would be restricted to off-peak hours. Since usage of the one remaining lane on 53rd Street by construction vehicles would completely close the street to through traffic, mitigating measures would be needed to direct traffic to alternate routes during those off-peak periods. A traffic enforcement agent or flagman would be positioned at the intersection of Park Avenue and 53rd Street and direct westbound traffic approaching the intersection to either divert northward or southward on Park Avenue and then use either 55th Street or 51st Street to complete their trip crosstown. Advance signage of this condition would be needed. This would increase traffic volumes and traffic delays on the affected streets, and would pose a significant problem to traffic destined to addresses on 53rd Street between Park and Madison Avenues, since direct access would no longer be possible during periods when truck deliveries block the middle lane. Provision would need to be made for traffic with destinations on that block to get to their destination. A possible strategy involves prohibiting curbside parking along the entire block, and to allow traffic destined to the block to enter from Madison Avenue, effectively providing two-way travel between Madison Avenue and the construction zone. This, however, could pose a serious conflict when a construction vehicle was not blocking the middle lane, and westbound through traffic driving on the block would confront two-way traffic midblock. A detailed plan to accommodate this condition safely would be developed.

Current parking regulations on the north curb are "No Standing 7 AM to 7 PM Except Sunday;" the south curb is signed "No Standing Except Trucks Loading and Unloading, 7 AM to 7 PM, Except Sunday." Both curbs would need to be signed "No Standing Anytime" at their east ends. There are also three midblock truck bays for Park Avenue Plaza and a side alley which would require that access is maintained. Five curb parking spaces would be lost on each side of the street.

In addition, reconstruction of the existing NYCT ventilation facility underneath 53rd Street would be required due to Option 1's effect on this structure. First, utilities must be relocated which are anticipated to take about eight months. During that time, one sidewalk would be reduced to about half of its current width for a length of about 150 feet (this work would alternate between the two sides of the street). While, the utility relocation work would occur only at night, the sidewalk reduction would be in effect all day.

Ventilation plant reconstruction would necessitate lane closures along 53rd Street for a distance of approximately 160 feet. One roadway lane would be closed at a time during decking installation, with work done at nighttime, for 8 months. After that initial eight-month period, one lane would be closed full-time during excavation and construction, which would necessitate prohibiting parking along one curb lane. Total construction on 53rd Street would last for up to 6 years (for both ventilation construction and as a staging area for the underpinning of Park Avenue buildings).

54th Street. For underpinning work at Lever House and 400 Park Avenue, both sidewalks and the curb lanes would need to be closed 24 hours per day. On the south curb, this work would last for about one year; along the north curb, it would last for about two years. The same types of impacts described above for 53rd Street would occur along 54th Street, with a need to maintain access to buildings on the block between Park and Madison Avenues at times when both curb lanes are used for construction work zones and the middle lane of 54th Street is being used for delivery vehicle activity.

Current parking regulations on the north curb are "No Standing Except Trucks Loading and Unloading, 7 AM to 7 PM, Except Sunday;" the south curb is signed "No Standing 7 AM to 7 PM, Except Sunday." There are two parking garages and one set of truck docks along the south curb, possibly just beyond the construction zone; access would need to be maintained to these facilities. One garage—the 200-space facility serving Lever House (390 Park Avenue)—would be closed.

As described above for 53rd Street, additional construction work would also be needed along 54th Street for ventilation plant utility relocations. During this work, anticipated to extend for about 1 year, one sidewalk would be reduced to about half of its current width for a length of about 300 feet on the west side of Park Avenue and about 200 feet on the east side. While the utility relocation work would occur at night, the sidewalk reduction would be in effect all day.

Construction of the new ventilation facilities would require lane closures along 54th Street for a distance of about 300 feet west of Park Avenue and 200 feet east of Park Avenue. One roadway lane would be closed at a time during decking installation, with work done at night, for 4 months. After that initial 4-month period, one lane would be closed full-time during structure excavation and construction, which would necessitate prohibiting parking along one curb lane. About 13 curb spaces would be lost on the north side of the street and 10 spaces on the south side of the street west of Park Avenue at times when "No Standing Anytime" regulations would be in effect to provide required traffic capacity; east of Park avenue, 8 spaces would be lost along the north curb and 9 spaces would be lost on the south curb. All aspects of construction on 54th Street would take approximately 5 years.

55th Street. The work required on 55th Street for Option 2 would be disruptive and could affect traffic movement and parking. However, this work would be much less intrusive than the work described above for 52nd, 53rd, or 54th Streets, since construction work on the new ventilation plant would occur beneath the street, accessed from the newly mined tunnels approximately 120 feet below Park Avenue. Limited disruption at the surface would occur to allow construction of a shaft to the street from the new facility, lasting approximately 2½ years.

44th Street. There would be a significant amount of excavation work related to construction of the terminal's ventilation building at 47 East 44th Street. Prior to the construction of the ventilation building, the site could be used as a contractor staging area. The north curb lane would be taken out of use for about 1½ years, while the middle lane would be used intermittently by delivery vehicles. The street itself would be decked over from the north curb line to the south building line to more easily accommodate the construction. Street and sidewalk impacts would be similar to those described above for 52nd, 53rd, and 54th Streets, but for just a 30-foot section of 44th Street, and over a period of about 1½ years. One curb parking space would be lost.

There is one parking garage, one building freight elevator, and a Federal Express delivery office on this block. Current parking regulations on the north curb are "No Standing Anytime," which would have to be maintained during the construction period. The south curb has "No Standing Except Trucks Loading and Unloading, 7 AM to 7 PM, Except Sunday." This regulation would have to be changed to "No Standing Anytime" to ensure that at least one travel lane exists along 44th Street during delivery of material.

45th Street. Weekend construction work would occur along the south side of 45th Street associated with construction of a new entrance to the LIRR. This work would extend approximately 100 feet west of Vanderbilt Avenue for about two years.

The north curb is frequently used by taxi pickups and dropoffs to the Roosevelt Hotel's front door, which has "No Standing, Hotel Loading" regulations. The south curb has an existing GCT entryway leading to the Roosevelt Passage and one building freight elevator. Current parking regulations on the south curb are "No Standing Except Trucks Loading and Unloading, 7 AM to 7 PM, Except Sunday." This regulation would be changed to "No Standing Anytime" to ensure that construction vehicles can be accommodated along the curb, maintaining one lane for travel; five curb spaces would be lost.

47th Street. There would be some localized construction effects along 47th Street just west of Lexington Avenue associated with the construction of a new entrance to GCT's existing 47th

Street crosspassage. This would include a possible closure of the sidewalk on the south side of the street near Lexington Avenue. There are no delivery truck docks on this section of 47th Street. Enforcement of the existing "No Standing 7 AM to 7 PM, Except Sunday" regulations would ensure that any delivery activity to the construction area would be accommodated out of the middle travel lane.

48th Street. One curb lane of 48th Street between Park and Madison Avenues would be taken for construction activities for two new entrances to GCT for a period of about 1 year. This block currently has midblock pedestrian cut-through walkways and several building delivery docks on either side and one emergency fire access entryway into GCT along the south side. Access would have to be maintained to these facilities. The north and south curbs do allow for curb deliveries with "No Standing Except Trucks Loading and Unloading, 7 AM to 7 PM, Except Sunday" regulations, although closer to Madison Avenue, no standing rules are posted along the north curb. These rules which would be changed to "No Standing Anytime" to ensure that at least one travel lane is maintained. About 18 curb spaces would be lost on the north side of the street and 14 spaces would be lost on the south side, depending on which side of the street would have its curb lane eliminated.

Roosevelt Island

A limited amount of truck activity would occur on Roosevelt Island during construction of the new substation, to transport soil off of the island. Total construction time at this location would be approximately 1 year.

Sunnyside/Long Island City

In general, construction activities in the Sunnyside/Yard A area would not result in significant traffic impacts since much of the work would be performed in existing rail yards with substantial room for construction staging and material storage. In addition, similar to the Manhattan alignment, much of the usual trucking activity could be avoided through the use of the existing rail infrastructure for the delivery of equipment and material. Some localized issues related to traffic are discussed below.

Construction of the new Sunnyside station (to occur after the construction in the vicinity of Northern Boulevard is complete) would require some temporary closures of one of two curb lanes on the Queens Boulevard bridge. While the construction staging for this element of the project would be within Sunnyside Yard with a main access point from Skillman Avenue, some portions of the construction process may require delivery of materials from the Queens Boulevard bridge. In addition, to the extent feasible, material and equipment would also be brought to the site via rail to a new spur track. However, temporary closures to a lane on the bridge, during off-peak periods could probably not be avoided. Due to the importance of this arterial and the level of traffic using Queens Boulevard throughout most of the day, closures would be based on approval from NYCDOT and may only occur during the weekend or at night. It is also expected that the one sidewalk would be closed during these times. Since this work would most likely occur at night, it is expected that the one remaining sidewalk could accommodate the pedestrian activity at that time. This impact is expected to last for 1½ years.

New fencing would be installed along the sidewalks of Queens Boulevard, which may require temporary closure of sidewalks on either side of the bridge. The construction of a new passenger drop-off area on the north side of Skillman Avenue would require temporary closure of the sidewalk and potentially, temporary closure of one westbound lane. Skillman Avenue in this area has one travel lane in each direction and curb parking just along its north curb, so some on-street parking spaces would be lost.

Construction of the new tunnels underneath Northern Boulevard would be accomplished with traditional tunneling methods. In general, one roadway lane would be taken for construction purposes at a time, although two lanes would be used during initial excavation and during final restoration of the roadway.

Construction activity within Sunnyside Yard may have impacts on one or more of the bridges passing over the yards. There may be a need to lower material from the 39th Street bridge to certain tracks. This activity would occur at night, with one of the bridge's lanes used for such activities. There may also be short-term outages on the 43rd and 48th Street rail bridges to lift steel girders into the construction zone. Besides these outages during steel erection, there would be no disruption to vehicular or pedestrian circulation during construction. The contractor would provide a minimum of five feet of pedestrian access on both walkways, and vehicular travel lanes in both directions. Parking under the structures during construction would be suspended.

For the replacement of the Thomson Avenue bridge pier, construction access would be provided from the level of existing tracks. A maximum of one vehicular lane would be closed during off-hours to modify the bridge's expansion joints. This pier replacement would not effect pedestrian movements.

The Honeywell Street bridge is currently closed to both vehicular and pedestrian traffic. Should it be opened prior to construction for the Preferred Alternative, such construction would not preclude vehicular or pedestrian traffic across the bridge. Construction on both the Honeywell Street bridge and the Queens Boulevard bridge (discussed above) would be coordinated with NYCDOT's programs for rehabilitating these structures.

A total of 40 parking spaces within a series of two-car garages lining the north side of Barnett Avenue between 43rd and 48th Streets would be demolished during the construction process and need to be replaced either during or after construction. If they are not replaced during construction, people currently parking there would be impacted and need to find on-street spaces (prevailing parking regulations in the area are generally "No Parking" alternate-side-of-the-street).

Blissville, Maspeth, Fresh Pond, and Highbridge Yards

It is not expected that the construction activities at Blissville, Maspeth, Fresh Pond, or Highbridge would result in any significant adverse traffic effects.

AIR QUALITY

Possible impacts on local air quality during construction of the Preferred Alternative may result from fugitive dust (particulate) emissions from construction of the surface track work, cut-and-cover sections, and, to a lesser extent, tunnel excavation. Air quality may also be affected by mobile source emissions—including PM_{10}, VOCs, NO_x, and CO emissions—from construction workers' private vehicles, disruptions in traffic due to construction, additional truck traffic, and construction equipment at the locations undergoing construction. It is expected that the any potential effects on air quality during construction would be temporary and of a relatively short duration.

FUGITIVE EMISSIONS

Fugitive dust emissions from construction operations can occur from excavation, hauling, dumping, spreading, grading, compaction, wind erosion, and traffic over unpaved areas. Actual quantities of emissions depend on the extent and nature of the clearing operations, type of equipment employed, physical characteristics of the underlying soil, speed at which construction vehicles are operated, and type of fugitive dust control methods employed. The U.S. Environmental Protection Agency (EPA) has suggested, in general, an overall emission rate of about 1.2 tons of particulates per acre per month of active construction from all phases of land clearing operations with no fugitive dust control measures. However, this is a national estimate and actual emissions vary widely depending on many factors, including the intensity and type of land clearing operations. Much of the fugitive dust generated by construction activities consists of relatively large particles, which are expected to settle within a short distance from the construction site. For this project, excavation and construction would be conducted with care and all appropriate fugitive dust control measures—including watering of exposed areas and dust covers for trucks—would be employed to minimize effects to nearby people or buildings.

Since much of the tunnel excavation work would not involve surface disturbance, many of the fugitive dust sources typically associated with construction work could be avoided. Excavated material would be transported through the existing 63rd Street Tunnel to the staging area at Northern Boulevard in Queens. The most likely transport method would be a conveyor system. While it is expected that large quantities of dust or blast fumes would be generated by the tunnel excavation, dust would be controlled at the source through the use of foams or other wetting agents. The work area within the tunnel would also be equipped with a mechanical ventilation system. This ventilation system, consisting of flexible ductwork and fans would be equipped with air pollution control and noise attenuation equipment at its exhaust point, most likely in the staging yard north of Northern Boulevard.

MOBILE SOURCE EMISSIONS

The CO emissions from construction workers driving to the segments being constructed, trucks driving to and from the construction area, and construction equipment operating on-site would not significantly affect air quality conditions. Construction vehicles are typically diesel-powered and therefore emit relatively low amounts of CO. Localized increases in mobile source emissions, including PM_{10} concentrations, would not be significant and would be minimized by incorporating the traffic maintenance requirements discussed above under Vehicular Traffic. In addition, the idling of delivery trucks or other equipment would not be permitted during periods when they are being unloaded or are not in active use.

The project would use rail transport to move construction supplies, materials, and excavate to the maximum extent possible, thereby limiting the air quality effects typically associated with trucking activity compared to other projects of this size. With the exception of the cut-and-cover work for the Preferred Alternative's ventilation facilities and new entrances, much of the proposed work in Manhattan would be accessed via rail. To the extent possible, material would be transported to the construction site using MNR facilities and the existing 63rd Street Tunnel, and excavated material would be removed using the same routes. This would eliminate the need to use a large number of trucks in Midtown Manhattan, where traffic congestion is greatest, thereby minimizing the potential for local short-term air quality impacts. Similarly, much of the work in Queens would use the existing rail network for material delivery and hauling of construction debris, rock, and soil. Although the final destination for excavated material has not been selected, using rail transport to either that final destination or to a location more suited for truck activity (i.e., less densely developed, with better connections to the regional highway system) would minimize or avoid any potential for adverse air quality impacts.

With respect to the effect of traffic diversions and potential reductions in the number of available traffic lanes due to construction activities on mobile source emissions, these impacts would be of a temporary nature, mostly unavoidable, and would be mitigated to the extent possible by the traffic control measures previously discussed.

MITIGATION

Excavation and construction would be conducted with care, and all appropriate fugitive dust control measures—including watering of exposed areas and dust covers for trucks—would be employed to minimize effects to nearby people or buildings. The traffic maintenance and protection plans would be designed to minimize, to the extent practicable, the vehicular congestion and associated air quality problems. Finally, to the maximum extent possible, the existing rail infrastructure would be used to transport materials to the various construction sites.

NOISE AND VIBRATION

As for most major projects, construction of the Preferred Alternative would result in increased noise and vibration levels during the construction period. Noise and vibration levels at a given location would depend on the kind and number of pieces of construction equipment being operated, as well as the distance from the construction site. These increases were calculated following the methodology described in Chapter 11, "Noise and Vibration," and are described below. (Chapter 11 also explains the analysis terminology associated with noise and vibration.) As noted in Chapter 11, potential noise and vibration impacts were evaluated using FTA's criteria set forth in its report, *Transit Noise and Vibration Impact Assessment* (April 1995).

NOISE

Typical noise levels of construction equipment expected to be employed during the construction process are presented in Table 17-1. Noise from construction equipment is regulated by EPA noise emission standards. These federal requirements mandate that: 1) certain classifications of construction equipment and motor vehicles meet specified noise emissions standards; and 2) construction material be handled and transported in such a manner as not to create unnecessary noise. These regulations would be carefully followed. In addition, appropriate low-noise emission level equipment would be used and operational procedures implemented.

Increases in noise levels caused by delivery trucks and workers traveling to and from the construction sites would not be perceptible. However, small increases in noise levels are expected to be found near a few defined delivery truck routes and the streets in the immediate vicinity of local construction areas. Except for the areas immediately adjacent to the sites, all truck trips would be restricted to truck routes. Specific issues related to each alternative are described below.

The noise associated with the different construction elements for the new tunnels, cut-and-cover construction in Manhattan and in Queens at Northern Boulevard, and work at the various yards in Queens and the Bronx is described below.

Tunneling Activities

In Manhattan, the new tunnels would be constructed using a variety of mining techniques, with such construction equipment as TBMs, jackhammers, line drills, and controlled blasting. Noise from mining activity under either option is not anticipated to be discernible, as most noise would be contained underground. Ground-borne noise is discussed below under "Vibration."

Cut-and-Cover Construction—Manhattan and Queens

The noise from excavation associated with the cut-and-cover construction would include noise from construction equipment such as backhoes, bulldozers, cranes, concrete mixers, concrete delivery trucks, delivery trucks, dump trucks, front-end loaders, pile drivers, and jackhammers.

In Manhattan, limited controlled blasting may also be required in some of the cut-and-cover areas where it is necessary to excavate below the rock level. At these locations, noise produced from blasting operations would be clearly discernible. Blasting operations would not occur on a regular schedule, and would only cause momentary increases in noise levels for the duration of the actual blasting (usually several seconds). In general, average hourly noise levels would be unaffected by blasting noise because of its short duration. However, the rapid and dynamic change in noise levels that result from blasting operations would be clearly discernible and intrusive at nearby residences and businesses. Blasting operations would be temporary, and are not expected to occur for more than a few months, for each localized construction area (i.e., an individual ventilation facility).

A specification would be inserted into construction contracts with regard to blasting operations requiring the contractor to implement a program to minimize noise impacts. Modern blasting techniques—such as timed multiple charges, blastmats, etc.—which tend to lessen the severity of blasting noise levels, would be employed.

While at excavation sites in Manhattan, retaining walls would be constructed using drilled piles and lagging, at sites in Queens (such as Northern Boulevard), either drilled soldier piles and lagging, or driven piles would be used. The impulsive noise produced from the hammering of piles or sheet piles into the soil in Queens would produce noise levels that are clearly discernible for distances of approximately 1,500 feet, and may be considered intrusive and annoying. Pile driving/sheet pile driving noise would be temporary, and is expected to occur during the early phases of each construction area.

Traffic diversions to side streets that may occur near construction areas would cause localized increases in noise on affected streets. In addition, the decking materials used as temporary cover for the excavated areas could cause increases in localized noise: in locations where steel plates are used to deck over the construction area, traffic passing over the plates would produce localized increases in noise levels as tires contact the discontinuity between the street surface and steel plates.

Overall, construction noise at sites excavated using cut-and-cover techniques would be intrusive and annoying, especially under Option 1, where work along 52nd, 53rd, and 54th Streets would take several years. For Option 2, only 55th Street between Park and Madison Avenues would experience cut-and-cover work for an extended period.

Table 17-1

Typical Noise Emission Levels for Construction Equipment

Equipment Item	Noise Level at 50 Feet (dBA)
Air Compressor	81
Asphalt Spreader (Paver)	89
Asphalt Truck	88
Backhoe	85
Bulldozer	87
Compactor	80
Concrete Plant	83[1]
Concrete Spreader	89
Concrete Mixer	85
Concrete Vibrator	76
Crane (Derrick)	76
Delivery Truck	88
Diamond Saw	90[2]
Dredge	88
Dump Truck	88
Front End Loader	84
Gas-driven Vibro-compactor	76
Hoist	76
Jackhammer (Paving Breaker)	88
Line Drill	98
Motor Crane	83
Pile Driver/Extractor	101
Pump	76
Roller	80
Shovel	82
Truck	88
Tug	85[3]
Vibratory Pile Driver/Extractor	89[4]

Notes:

[1] Wood, E.W. and A.R. Thompson, Sound Level Survey, Concrete Batch Plant: Limerick Generating Station, Bolt Beranek and Newman Inc., Report 2825 Cambridge, MA, May 1974.

[2] New York State Department of Environmental Conservation, Construction Noise Survey, Report No. NC-P2, Albany, NY, April 1974.

[3] Bungener, J.H., Sound Level Survey: Wise's Landing, Kentucky, Bolt Beranek and Newman Inc., Report 2880, Downers Grove, IL, June 1975.

[4] F.B. Foster Company, Foster Vibro Driver/Extractors, Electric Series Brochure, W-925-10-75-5M.

Source: Patterson, W.N., R.A. Ely, and S.M. Swanson, Regulation of Construction Activity Noise, Bolt Beranek and Newman, Inc., Report 2887.

Sunnyside Yard/Yard A

While much of the construction work in this area would be noise-intensive, it is not expected to be intrusive to the surrounding neighborhood. The yard complex is surrounded by industrial uses and existing noise levels outside the yards are high, especially along Northern Boulevard with its elevated subway. The cut-and-cover work at Northern Boulevard would be the most noticeable, but considering the existing noise from the elevated subway and the heavy vehicular traffic at Queens Plaza, it is not expected that this work would have significant noise impacts on surrounding uses, which are commercial and industrial. However, construction activities in the Queens staging yard may result in significant adverse noise impacts on the Newcomer High School nearby. A site access plan would be developed to ensure that equipment and materials would be delivered from a street away from the school.

Yards

The construction work anticipated at the various yards—Blissville or Maspeth, Fresh Pond, and Highbridge—would not be significant. Most of the construction involves only surface track work with some utility work. Some structures would be constructed, possibly requiring deep foundations. At all locations, existing noise levels are high because of rail and/or highway activity, and surrounding areas are either predominantly industrial or (at Fresh Pond and Highbridge) residential uses are buffered from the construction area.

Harold Interlocking Reconstruction Between 43rd and 48th Streets

In Queens, it is expected that the construction work on Harold Interlocking between 43rd and 48th Streets would result in the greatest noise effects on nearby sensitive receptors. Residential uses exist just across Barnett Avenue, approximately 70 feet from the proposed construction area. The most intrusive activity would involve the placement of piles for the viaduct's foundation and noise from construction equipment. Viaduct piles would be constructed via auger/cast-in-place methods to minimize construction noise. Construction auguring would occur during off-peak, daylight hours, during a 3-month period. While intrusive, most of the noise-intensive activity such as pile-drilling would occur during the day and would be temporary in nature. Furthermore, a noise barrier could be installed along the construction alignment to minimize the noise effect on the adjacent neighborhood.

At the site of cut-and-cover sections in the vicinity of Northern Boulevard and the Harold Interlocking work east of 43rd Street in Queens, noise from construction activities would result in significant noise impacts at surrounding receptors. Where feasible, plywood barriers would be constructed around the excavation of cut-and-cover sections. However, these barriers would have limited effectiveness in reducing noise levels from construction activities. In general, such barriers reduce noise at receptors that are shielded from the line of sight of the noise source, but not at those that maintain a line of sight.

To reduce the noise associated with blasting, the contractor would be required to use modern blasting techniques—such as timed multiple charges, blastmats, etc.—which tend to lessen the severity of blasting noise levels.

There are no cost-effective mitigation techniques that effectively reduce noise from pile driving operations. In certain geological conditions, however, vibratory pile drivers can be used. These produce noise levels that are approximately 7 dBA lower than impact pile drivers.

VIBRATION

Controlled blasting, pile driving, pavement-breaking, Tunnel Boring Machine (TBM), and muck train operations would create the most noticeable change in vibration levels. The FTA has set vibration-induced architectural damage thresholds at a Peak Particle Velocity (PPV) of 0.20 inches per second (100 VdB) for fragile buildings and 0.12 inches per second (95 VdB) for extremely fragile buildings. "Architectural" damage refers to minor cosmetic cracking. Structural damage can occur at much higher vibration levels. Construction projects typically employ a nominal structural damage criterion of 2 inches per second (126 VdB). Human annoyance vibration criteria are much lower (perception is at approximately 65 VdB; the FTA annoyance-based impact criterion is 72 VdB for frequent events) than structural or architectural damage criteria.

The FTA guidance documents provide vibration levels and methods for calculating vibration levels at a specified distance for various pieces of construction equipment. However, the documents do not address many of the vibration-producing construction techniques that may be employed in this project. Based on the FTA and other sources, vibration source levels were defined for various construction activities and are shown in Table 17-2.

Table 17-2

Typical Vibration Source Levels

Activity	PPV Vibration Levels @ 25 feet (in/sec)
Pile Driving/Sheet Pile Driving (Impact)	1.518
Pile Driving/Sheet Pile Driving (Vibratory)	0.734
Pavement Breaking	0.644
Muck Train	0.100
Tunnel Boring Machine (TBM)	0.124
Bulldozing	0.089
Heavy Truck Traffic	0.076
Jackhammers	0.035

Sources:

Wiss, John F. "Construction Vibrations: State-of-the-Art." Journal of the Geotechnical Engineering Division,Proceedings of the American Society of Civil Engineering Division, Proceedings of the American Society of Civil Engineers, Volume 107, No. GT2, February, 1981.

Standard Recommended Practice for Evaluation of Transportation Related Earthborne Vibrations. ASHTO Designation: R8-81(1986).

Transit Noise and Vibration Impact Assessment. Federal Transit Administration, U.S. Department of Transportation, April 1995.

Dowding, Charles H. *Construction Vibrations*. Prentice Hall. 1996.

Sauseman, Hugh. "Vibration from Metro Rail Tunneling Operations," LATC. 1993.

The potential for vibration impacts as a result of construction of the Preferred Alternative is described below, and generalized vibration mitigation measures to avoid potential construction-related vibration impacts are identified. A more detailed vibration analysis will be included as part of the final design work, once design details are known. The detailed vibration analysis will account for specific geological conditions, foundation assessment of all structures near vibration-causing construction activities, and the appropriateness of the criteria stated above to each affected building. Finally, the detailed analysis will include specific vibration mitigation measures.

Tunnel Boring Machine(s)

Soil conditions have a strong influence on the levels of ground-borne vibration. Although shallow bedrock tends to transmit vibrations more efficiently, vibration sources in rock tend to result in low amplitudes of vibration levels. The dense bedrock through which the TBMs would tunnel should attenuate vibration levels at the cutting head of the TBMs. Vibration levels at the foundations of buildings may be perceptible, but should be below the conservative damage threshold of 0.12 inches per second. Ground-borne noise levels resulting from constant operation of the TBMs under either engineering option may produce a perceptible rumbling sound in some nearby buildings for several weeks, as the TBM approaches, passes under, and moves beyond the building.

Muck Trains

Muck trains are used to remove "muck" or debris from tunneling activities. Data from the Los Angeles County Transportation Commission indicates that muck trains can cause perceptible ground-borne vibration in residences within 200 feet from the muck trains, which may be considered intrusive. This vibration is caused by the muck train wheel/rail interaction and direct contact between the rail and tunnel floor. Vibration from muck trains would be below the 0.12 inch/second criteria for extremely fragile buildings.

Drill and Controlled Blasting

As described earlier, several project components associated with the Preferred Alternative may require blasting. To avoid vibration-induced damage from any potential blasting operations, monitoring programs and a variety of control measures would be instituted (see vibration mitigation below). Vibration control measures would ensure that vibration levels at the foundations of nearby buildings remain below the architectural (0.20 in./sec for fragile buildings and 0.12 inches/second for extremely fragile historic buildings) and structural damage (nominally 2 inches/second) during blasting operations. Due to their short duration (a few seconds), using cautious blasting techniques, vibrations will be distinctly perceptible at a distance of 200 feet and barely perceptible at 300 feet.

The underpinning of the four office buildings on the westside of Park Avenue and the creation of tunnels beneath them required as part of Option 1 would involve controlled blasting to excavate the rock beneath the existing buildings. For the Lever House and the Racquet & Tennis Club this work would last approximately 6 months, while the work at 400 and 410 Park Avenue would require less time. While the effects would be of very short duration (4-5 seconds a few times a day), they may be disconcerting to some building occupants. At these locations, with primarily daytime uses, all efforts would be made to schedule the blasting during hours of least disruption.

Currently, outreach efforts are focusing on informing building owners and tenants of potential disruptions due to these elements of construction. This outreach will be enhanced during final design of the Preferred Alternative. During construction, public support personnel will be on-site to handle specific issues which may arise.

Cut-and-Cover Construction

At locations where cut-and-cover construction is required, pavement breaking, earthmoving (digging) operations, pile driving, and any potential blasting activity (discussed above) would produce high vibration levels. In areas where buildings are within 80 feet of construction areas, deep saw cuts would be made between areas of pavement breaking and the sidewalk areas in front of buildings. As described earlier, these saw cuts would minimize the transmission of vibrations from pavement-breaking operations to the foundations of nearby structures. With this mitigation, ground-borne vibration levels should be below the criteria at the foundations of near-by buildings. Vibrations from pavement-breaking operations may be annoying at distances of 300 feet from pavement-breaking operations (including basement paving in buildings to be underpinned in Option 1).

Vibration Mitigation Measures

The first step in the vibration mitigation program would be to perform a detailed building assessment and damage criteria analysis during the project's next phase once an alternative is selected and approved by FTA. The purpose of the analysis is to properly design specific aspects of the construction process such as the size of blasting charges to account for nearby characteristics. Methods are available to categorize buildings by susceptibility to vibration and to identify appropriate frequency-based vibration criteria for these categories.

Pavement Breaking. To avoid architectural damage (e.g., cracked plaster) to extremely fragile buildings within 80 feet of the construction work, deep saw cuts would be made between areas of pavement breaking and the sidewalk areas in front of buildings. With this technique, ground-borne vibration levels should be below the criteria at the foundations of most buildings and no damage is anticipated.

Pile Driving. Pile driving will occur in only a few locations—in Queens at Northern Boulevard, and perhaps in areas of Harold Interlocking work. There are no mitigation techniques that fully reduce vibration from pile driving operations. In areas where geological conditions permit their use, vibratory pile drivers would be used to reduce the vibrations associated with this activity. Unlike noise, the total vibration level produced can be significantly reduced when each vibration source operates separately. In addition, at locations near fragile historic resources, additional measures would be employed to keep vibration levels below appropriate damage criteria (see the discussion below).

Drill and Controlled Blasting. The vibration effects from controlled blasting would be intermittent, with blast vibrations occurring for a few seconds at a time. Efforts would be made to minimize potential vibration impacts from blasting operations in all anticipated areas of blasting activity, as described above. A specification would be inserted into construction contracts with regard to blasting operations requiring the contractor to implement a monitoring program and to protect nearby structures from damage.

All blasts would be limited to the U.S. Bureau of Mines Standard for maximum air blast. Borehole size and matrix would be determined on-site by a New York State licensed blaster based on prevailing rock conditions. A licensed blasting contractor would comply with applicable state regulations concerning workplace safety and hazardous materials, under the direction of a licensed blaster. Each blast would be contained through the use of rubber or steel cable blasting mats, earthen cover, or by utilization of the original overburden to prevent flyrock, all in accordance with New York State Department of Transportation Standard Specifications. Line drilling and smooth-wall techniques would be used to reduce ground vibration. Modern controlled blasting techniques such as timed multiple charges, which lessen the severity of vibration levels, would be implemented.

The use of explosives would be limited to labor skilled in their use and all work would be performed under supervision of a licensed blaster. Blasting programs, including the amount and type of explosives and number and type of delays to be used, would be in accordance with all applicable municipal requirements. A daily log would be maintained by the blasting contractor for each blast detonated on each working day. This log would include the date, exact time of firing, number of holes, total poundage used, the distribution of instantaneous and millisecond delay caps, poundage per delay, and location and spacing of drilling holes. The log would be submitted to the project superintendent at the end of each working day.

Vibration levels would be monitored in the foundations of nearby buildings during all blasting activities. Blasting activities resulting in peak particle vibration levels in excess of appropriate damage criteria as measured in the foundations of nearby structures would be immediately stopped until further precautionary measures are taken to reduce blasting-related vibration impacts. Work would not begin again until the steps proposed to stabilize and/or prevent further damage to the designated buildings were approved. In addition, the project, under an OCIP, would carry insurance to cover the expense of restoration caused by any damage that might occur despite this precaution.

Special Provisions For Historic Structures. In addition to the mitigation measures described above, special measures set forth by the New York City Landmarks Preservation Commission would be followed to protect historic resources from increased vibration levels associated with construction activities. At any construction locations where historic resources, and particularly older fragile building, are within an area of potential effect (see Chapter 7, "Historic Resources," for more details), construction contractors would be required to implement special vibration protection measures. These measures, to be included as part of the construction protection program for historic resources (discussed above under "Historic Resources") would likely include the following:

- Inspect and report on the current foundation and structural condition of any historic resources.
- Set up a vibration monitoring program to measure vertical and lateral movement and vibration to the historic structures during nearby construction activities. Details as to the frequency and duration of the vibration monitoring program would be determined as part of the project's ongoing consultation process with the State Historic Preservation Office and the Advisory Council on Historic Preservation.
- Establish and monitor construction methods to limit vibrations to levels that would not cause structural damage to the historic structures, as determined by the condition survey;
- Issue "stop work"orders to the construction contractor, as required, to prevent damage to the structures, based on any vibration levels that exceed the design criteria in lateral or vertical direction. Work would not begin again until the steps proposed to stabilize and/or prevent further damage to the designated buildings were approved.

UTILITIES AND SUBSURFACE STRUCTURES

As described in detail in Chapter 13, "Utilities," some utilities would have to be relocated as part of the construction of the Preferred Alternative. All necessary agreements would be executed with each utility company or governmental agency regarding the temporary or permanent relocation of any utilities, as well as the responsibility for and coordination of the actual work, and method of reimbursement. Overall, utility service would be maintained throughout construction, and no significant impacts would occur.

CONTAMINATED MATERIALS

As discussed in Chapter 14, "Contaminated Materials," construction of the Preferred Alternative has the potential to expose contaminated soil and/or groundwater, as well as asbestos. At areas where surface work (such as laying new track and adding or relocating utilities and signals) would occur, contaminated soils or groundwater could be exposed. In addition, at some project locations, localized pockets of contamination or underground fuel storage tanks or other buried objects such as drums could be encountered during excavating and grading activities at any of the rail yards.

Therefore, prior to any additional environmental investigation or construction activity that could expose contaminated or hazardous materials, site-specific environmental Health and Safety Plans (HASPs) would be created to provide guidance related to hazardous materials or chemicals that may be encountered. After the design of project elements is more fully developed and prior to the start of construction, additional soil and groundwater sampling would be undertaken in all project construction areas where contaminated materials were identified. This additional work would be designed to characterize the nature, approximate quantity, and extent of contaminated materials within defined vertical and horizontal construction boundaries. This would be undertaken to address worker safety and to identify any soil or groundwater that would require special off-site disposal. The provisions of the HASPs would be mandatory for the contractors and subcontractors engaged in any on-site construction activities that have the potential to expose their personnel to the existing soils on the site. In addition, all on-site personnel would be required to follow all applicable local, state, and OSHA construction codes and regulations.

The HASPs would establish methods to limit site access, include an air monitoring program for particulates (dust) and VOCs, and would set standard safe operating procedures for the construction crew. The plans would also outline criteria to be used to identify non-routine and potentially dangerous conditions, such as petroleum odors, oil sheens, and discolored soil and groundwater. Any contaminated materials encountered during construction would be handled, stored, and disposed of in accordance with all applicable federal, state, and local regulations and in compliance with the site-specific HASPs.

As described in Chapter 14, Sunnyside Yard has been designated by the New York State Department of Environmental Conservation (NYSDEC) as a Class II Inactive Hazardous Waste Site. A plume of PCB-contaminated oil has been identified in the groundwater beneath Sunnyside Yard and Yard A. Special care would be taken at Sunnyside Yard, including ongoing coordination with Amtrak and NYSDEC, to ensure that the project would not interfere with any remediation efforts at the yard. In addition to using special construction techniques at Yard A, the project would construct tunnels deep beneath Sunnyside Yard to avoid affecting contaminated areas in any way.

To avoid the impacts associated with encountering the contaminated plume in the groundwater at Yard A and Sunnyside Yard, project-related excavation in Yard A would use a slurry cut-off wall with limited permeability to minimize the amount of dewatering required. As described earlier, this work would begin with excavation of a large area. If required, soil and groundwater would be removed from this area, tested, and disposed of properly. Otherwise, the material could be re-used on site. The excavation area would then be enclosed with virtually watertight walls constructed using slurry and jet grout. This new excavation area would thus provide a protected location for construction activities, separate from the contaminated groundwater beneath the yard. In addition, the Construction Contaminant Management Plan (CCMP) would require monitoring during construction to determine whether the plume moves. If it does move, water from dewatering could be reinjected to reduce movement of the plume, or additional extraction wells or slurry walls could be installed to capture PCB-contaminated oil. During construction, the HASP would specify precautions to be taken to minimize worker contact with groundwater, including the use of safe work practices and protective clothing.

State and city regulations restrict the pumping of contaminated groundwater to rivers or sewers. The project specifications for dewatering during construction would include testing to ensure that regulatory levels are not exceeded and that, therefore, no significant impacts would occur. Based on groundwater sampling performed to date, all groundwater (other than the PCB-contaminated plume at Sunnyside/Yard A) could be pumped to sewers without further treatment. However, settling basins may be required at Yard A to reduce levels of suspended metals. The CCMPs would provide details on the extent of any groundwater treatment, if necessary, before discharge. At Highbridge Yard, the only likely site where discharge to surface water is feasible, sampling results indicate that, if necessary, groundwater could be pumped to the Harlem River without treatment. If dewatering to the river is necessary at Highbridge, a testing program and site-specific discharge limits would be developed with NYSDEC.

NATURAL RESOURCES

Due to construction activities, there would be increased potential for on-site erosion and sedimentation at construction sites where soils would be disturbed. A stormwater management plan with sequencing and specific details would be prepared and implemented during construction to avoid impacts associated with erosion and stormwater runoff. Proper implementation of the plan, and its sequence and maintenance schedule, would ensure minimal impacts associated with construction-related soil disturbance.

Erosion and stormwater control would be accomplished through a combination of structural as well as vegetative measures. Several structural erosion and sediment control measures would be used. A series of temporary sediment traps would be strategically located within the project sites, where runoff within the construction zones would be collected and settled. Straw bales would be used to protect all proposed catch basins and other drainage structure inlets.

Anti-tracking entrances would be installed at the project entrances. In addition, silt fencing would be installed along contours directly below construction zones and used where sheet flow is likely to occur. This fencing would be installed prior to construction activity to delineate areas predetermined as construction zones. Temporary and permanent vegetative measures are proposed to stabilize soils on the site.

With these measures in place, erosion and stormwater pollution would be minimized. This would avoid adverse impacts to water bodies near the construction sites, including the Harlem River adjacent to Highbridge Yard.

At all construction sites, a rodent control program would prevent rodents from using the construction areas as breeding grounds.

SAFETY AND SECURITY

The project would not involve construction methods, procedures or locations that would pose significant safety or security problems. Most of the construction activities would occur in areas where the general public has no access (e.g., within rail yards and in enclosed underground tunnels). Public access to all construction sites would be restricted. Standard safety and security measures would be followed and the most stringent provisions of the applicable statutes and regulations of New York City and New York State, and the Department of Labor, Occupational Safety and Health Administration, pertaining to the safe performance of the work, would be observed.

In the few instances where contractors would obstruct sidewalk pedestrian areas in the performance of the work (for instance, to excavate for ventilation facilities near Park Avenue in Manhattan), protective sidewalk sheds, barricades, warning signs, and other items to protect the public would be provided.

All sites would be secured during construction to prevent trespass, theft, and vandalism.

A project-wide Environmental HASP is being developed for the project to delineate project-wide policies and requirements for railroad safety, construction safety, environmental safety and industrial hygiene. Contractors would address these policies when preparing their site-specific and activity-specific HASPs. The plan is based on a "Zero Incident" concept that identifies proactive elements considered essential to achieving and sustaining "Zero Incident" performance. Contractors would use preventive and not reactive measures in controlling hazards. Inspections, self-assessments, and trending to identify problem areas and actions to remediate problem areas would be required.

The safety plans developed by each contractor would contain the following elements:

- Job hazard analysis—requirement for a review of the detailed work scope in order to plan for safety in each task;
- Task descriptions—requirement for including equipment, materials, controls, crew size, job responsibilities, operating procedures, and maintenance practices;
- Hazard assessment—requirement to identify potential safety concerns;
- Protection methods—requirement to describe methods to protect workers, the public, and the environment;
- Protective equipment—requirements for selection and use of the appropriate devices for the hazards to be confronted; and
- Emergency response procedures—requirements for spill response and project participants, local agencies, including fire and police departments, and the community.

⁂

A. INTRODUCTION

On February 11, 1994, President Clinton issued Executive Order 12898, "Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations." This Executive Order is designed to ensure that each federal agency "shall make achieving environmental justice part of its mission by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations."

Executive Order 12898 also requires federal agencies to work to ensure greater public participation in the decision-making process. To this end, the East Side Access Project has an extensive public participation and community outreach program, described in Chapter 23 of this EIS.

This chapter analyzes the project's potential impacts in terms of their effects on minority and low-income populations, to determine whether it has any disproportionately high and adverse impacts on those populations. It follows the U.S. Department of Transportation's *Final Order on Environmental Justice*, April 1997, as well as the U.S. Environmental Protection Agency's *Guidance for Incorporating Environmental Justice Concerns in EPA's NEPA Compliance Analyses*, April 1998.

As set forth in the U.S. Department of Transportation's Final Order on Environmental Justice (at section 8.b.), "In making determinations regarding disproportionately high and adverse effects on minority and low-income populations, mitigation and enhancement measures that will be taken and all offsetting benefits to the affected minority and low-income populations may be taken into account, as well as the design, comparative impacts, and relevant number of similar existing system elements in non-minority and non-low-income areas." The analysis below therefore focuses on any significant adverse impacts that cannot be mitigated, and considers the population affected by those impacts as well as the population benefitting from the project.

B. OVERVIEW OF PROJECT IMPACTS AND AFFECTED POPULATION

The project alternatives' potential significant adverse impacts are described in Chapters 3 through 17 of this document. As described in those chapters, the No Action Alternative and TSM Alternative would result in adverse effects on land use, social conditions, and economic conditions by not supporting the growth projected for the region or transit-oriented land use. The Preferred Alternative, by greatly improving transportation service in the Long Island Transportation Corridor (LITC) would result in significant positive effects for the region in those areas as well. It would have some localized adverse impacts close to the project alignment.

OVERVIEW OF LITC POPULATION CHARACTERISTICS

The population of the project area is detailed in Chapter 4, "Social Conditions," and summarized in Table 18-1. As shown in the table, the population of the LITC, with a population of 8.3 million people, is 64.5 percent white, 21.8 percent black, 6.2 percent Asian, and 16.3 percent Hispanic (an ethnic group that can include white, black, and Asian people). The median household income of the LITC is $36,300, with some 13.8 percent living below the poverty level. In New York City, which includes 88 percent of the LITC's population, the percentages of minority population and population living below the poverty level are higher, and the median income is lower, while on Long Island the reverse is true.

Table 18-1

Study Area 1990 Population Characteristics

		Race and Ethnicity (Percent)				Economic Profile	
Area	Population	White	Black	Asian	Hispanic*	1989 Median Household Income**	Below Poverty Level*** (Percent)
Manhattan Study Area	637,599	72.6%	7.4%	13.4%	15.2%	$41,499	14.7%
Total Manhattan	1,487,536	58.3%	22.0%	7.4%	26.0%	$32,262	20.5%
Long Island City/ Sunnyside Study Area	6,353	59.9%	6.4%	18.9%	39.6%	$27,075	14.3%
Total Queens	1,951,598	57.9%	21.7%	12.2%	19.5%	$34,186	10.8%
Total New York City	7,322,564	52.3%	28.8%	7.0%	23.7%	$29,823	18.9%
Nassau County	1,287,348	86.6%	8.6%	3.1%	6.0%	$54,283	3.7%
Suffolk County	1,321,864	90.0%	6.3%	1.7%	6.6%	$49,128	4.6%
Total Nassau and Suffolk	2,609,212	88.4%	7.4%	2.4%	6.3%	$51,671	4.2%
Total LITC	8,349,010	64.5%	21.8%	6.2%	16.3%	$36,300	13.8%

Notes:

* An ethnic group that can include members of all different racial categories.

** The median household incomes reported for the study areas are weighted averages of those reported for the census and/or block groups in the study areas. The median household income for the LITC is a weighted average of those reported for the counties in the LITC.

*** Percent of persons with incomes below the established poverty level; poverty level varies depending on household size.

Source: U.S. Department of Commerce, Bureau of Census, *U.S. Census of Population and Housing*, 1990.

NO ACTION ALTERNATIVE

The No Action Alternative would result in adverse impacts on land use, social conditions, and economic conditions throughout the LITC. It would also result in adverse impacts in terms of transportation service and regional air quality. With a potential deterioration in rail transit service under the No Action Alternative, access throughout the region would become more difficult and the expected population and employment growth would likely be limited. On Long Island, where use of the Long Island Rail Road (LIRR) is greatest, the decrease in quality of LIRR service would be felt most strongly and would support a trend toward sprawling development and an area characterized by increased dependence on the automobile. In addition, without improvements to mass transit service, traffic congestion and regional air pollution would increase. These adverse impacts would affect the full range of people throughout the LITC, and would therefore not result in any disproportionate impacts on low-income or minority populations.

TSM ALTERNATIVE

The TSM Alternative would also have adverse effects on land use, social conditions, and economic conditions, although these would be less severe than with the No Action Alternative. Again, the predicted increases in population and employment would likely be achieved under strain. In Manhattan, the existing disconnect between the location of jobs and commuter terminals would not be improved, and improvements would not be sufficient to avoid the overcrowding and delays that are likely to occur in the future. Similar to the No Action Alternative, these adverse impacts would affect the full range of people throughout the LITC, and would therefore not result in any disproportionate impacts on low-income or minority populations.

PREFERRED ALTERNATIVE

Overall, the Preferred Alternative would greatly improve transportation service in the LITC, and would therefore support land use patterns, social conditions, and economic conditions. The population and employment predicted to occur throughout the region would be supported by this improvement, resulting in significant beneficial impacts to the region's economy. Regional vehicle miles traveled (VMT) would decrease overall, resulting in improvements to air quality as well.

At the same time, the Preferred Alternative would result in some localized adverse impacts, described in earlier chapters of this EIS. Most of those impacts could be mitigated, but several could not be fully mitigated. The Preferred Alternative's significant adverse impacts, mitigation measures, and impacts that cannot be fully mitigated are summarized in Table 18-2. The impacts that cannot be fully mitigated are discussed below.

SUMMARY OF UNMITIGATED IMPACTS

Social Conditions

As described in Chapter 17, "Construction and Construction Impacts," construction activities required for the Preferred Alternative would result in temporary but significant adverse impacts to neighborhood character in Manhattan, which would be more severe under Option 1 than under Option 2. Construction activities in Queens would result in temporary but significant disruption to the Long Island City High School, near 41st Avenue and Northern Boulevard. The project would work with the high school to resolve problems as they arise.

Transportation

Although the Preferred Alternative overall would provide substantial transportation improvements, it would also result in certain generally localized adverse impacts related to transportation service. The impacts that could not be fully mitigated would be as follows:

- Parking shortfalls at some LIRR stations in eastern Queens and on Long Island.
- Impacts to some elements at the 42nd Street/Grand Central Terminal station on the Lexington Avenue (No. 4, 5, and 6) subway line.

Table 18-2

Summary of Impacts and Mitigation Measures for the Preferred Alternative

Analysis Area	Potential Significant Adverse Impacts	Mitigation	Unmitigated Impacts
Land Use, Zoning, and Public Policy	None	None required	None
Social Conditions	Temporary impacts on neighborhood character during construction at selected locations: • In Manhattan at 52nd, 53rd, and 54th Streets under Option 1 • In Manhattan at 55th Street under Option 2 • In Queens at Barnett Avenue if buildings are removed for construction staging	In Manhattan, partial mitigation through maintenance and protection of traffic plan. In Queens if buildings are removed, temporary noise wall during construction; replace buildings after construction.	Temporary disruption in Manhattan could be only partially mitigated.
	Temporary impact to Long Island City High School near 41st Avenue during construction	The school would be shielded from construction activities as much as possible, and the project would work with the high school to resolve problems.	Temporary disruption at school could only be partially mitigated.
Economic Conditions and Relocation	Displacement and relocation of businesses and private garages Subsurface easements	Acquisition of properties under the federal Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970	None
Visual and Aesthetic Considerations	Potential for impacts in Queens if buildings along Barnett Avenue are removed	If buildings are removed, temporary noise wall during construction; replace buildings after construction	None
Historic Resources	Changes to historic features of Grand Central Terminal: • Under Option 1, changes to Biltmore Room, Biltmore Passage, and portion of Dining Concourse; new ticket windows • Under Option 2, new mezzanine in area of tracks and platforms at western end of Dining Concourse level	Ongoing consultation regarding design features and construction work with the State Historic Preservation Office (SHPO) as required by Section 106 of the National Historic Preservation Act	None
	Potential changes to the context of historic resources from project elements in Manhattan (new entrance near Vanderbilt Concourse building and new vent building on 44th Street adjacent to Yale Club)	Ongoing consultation with SHPO	

Table 18-2 (Continued)

Summary of Impacts and Mitigation Measures for the Preferred Alternative

Analysis Area	Potential Significant Adverse Impacts	Mitigation	Unmitigated Impacts
Historic Resources (continued)	Potential impacts during construction to historic resources near the construction work: • Under either option, construction work in GCT • Under either option, construction work adjacent to Vanderbilt Concourse building and Yale Club • Under Option 1, work beneath Racquet & Tennis Club and Lever House • Work near Office and Switch Tower Q in Sunnyside Yard	Construction protection plan to be implemented in coordination with SHPO	
Archaeological Resources	Disturbance of possible buried archaeological resources during construction	Ongoing consultation with SHPO; additional work to determine whether archaeological resources are located in construction areas, once preliminary engineering is under way	None
Transportation	Congestion from vehicular traffic at certain intersections near GCT and LIRR stations in eastern Queens and on Long Island	Standard traffic improvement measures	None
	Parking shortfalls at certain LIRR stations	Various measures as part of LIRR parking improvement program	Partially unmitigated
	Impacts on Lexington Avenue (4,5,6) subway	Improvements to station elements (e.g., new turnstiles, stairs, wider corridor) and improving throughput of trains	Some impacts remain partially unmitigated
	Pedestrian impacts in and around GCT	Various improvements (e.g., widen crosswalks, adjust escalator operations)	None
	Impacts on Metro-North Railroad operations during construction of Option 1	Implementation of Option 2 avoids impacts	Under Option 1, temporary impacts unmitigated
	Impacts during construction at 52nd, 53rd, 54th Streets under Option 1; Impacts during construction at 55th Street during construction of Option 2	Maintenance and protection of traffic plan	Temporary impact remains partially unmitigated
Air Quality	De minimis increase in carbon monoxide at Madison Ave and 48th Street from increased congestion	The same measures to be used for vehicle congestion (above)	None

Table S-2 (Continued)
Summary of Impacts and Mitigation Measures for the Preferred Alternative

Analysis Area	Potential Significant Adverse Impacts	Mitigation	Unmitigated Impacts
Noise and Vibration	Based on FTA criteria, noise impacts in Queens and Long Island along right-of-way at selected locations from increases in train service. However, noise level increases under build conditions would be imperceptible compared to No Action levels	Mitigation would require extensive use of noise walls, which is not practicable	Noise impacts would be unmitigated
	Ground-borne noise impacts in Manhattan from operation under Option 1	A range of track fixation methods, including resilient ties, pads, and fasteners, and floating slabs at select locations	None
	Ground-borne noise impact from operation of new service in Queens	Most impacts mitigated with resilient ties, pads, and fasteners. One or two locations could require ballasted track, ballast mats, or a floating slab	None
Energy	None	None required	None
Utilities	Potential conflicts on existing utilities during construction	Relocate affected utilities and maintain service	None
Contaminated Materials	Potential exposure to contaminated materials during construction	Implementation of Health and Safety Plan	None
Natural Resources	Potential erosion and stormwater impacts during construction	Implementation of project design elements to control stormwater	None
Safety and Security	None	None	None

- Temporary impact on Metro-North Railroad operations during construction of Option 1.
- Temporary impact to traffic and parking conditions associated with cut-and-cover construction activities required for Option 1.

Noise and Vibration

The Preferred Alternative would increase train service throughout the LIRR service area. The increase in trains would result in significant noise impacts, when compared to existing conditions. These impacts would, however, be imperceptible relative to the future conditions that would occur without the project in place (the No Action Alternative). Mitigation for the predicted noise impacts would consist of extensive use of noise barriers along the rail right-of-way, which is prohibitively expensive and not practicable.

AFFECTED POPULATION

Social Conditions

The temporary impacts to neighborhood character that would occur during construction of the Preferred Alternative would affect a diverse population. In Manhattan, there are few residents living with the immediate areas of construction. The population that does live in block groups within the area proximate to the affected locations is lower than the Manhattan average in terms of minority and low-income percentages. In addition to residents, this work would adversely affect daytime visitors to this part of Manhattan, including workers and shoppers in the area as well as other visitors. These daytime visitors would certainly be a diverse population.

In Queens, the population affected by the significant impact during construction to Long Island City High School would be the students of the school. Since this building is home to Newcomer High School, a school for immigrant students, the affected population is likely to be largely poor and most likely includes a high percentage of minority students.

Transportation

The parking shortfalls predicted to occur with the Preferred Alternative would affect a broad spectrum of LIRR riders, most likely representing a cross section of Long Island's population. Similarly, the impacts that could occur to Metro-North service during construction of Option 1 would also affect a diverse population of commuters.

The temporary impact on traffic and parking conditions on East 52nd, 53rd, and 54th Streets during construction of Option 1 and on 55th Street for Option 2 would affect the same type of broad population as described above under "Social Conditions" for this area.

The impacts predicted for the Lexington Avenue subway at 42nd Street would affect Metro-North and new LIRR commuters transferring between commuter rail and the subway, as well as residents who live in the area and employees commuting to the area via subway. This broad range of people is ethnically, racially, and economically diverse. The Lexington Avenue line serves the entire East Side of Manhattan, as well as the Bronx, Brooklyn, and riders from Queens who transfer via the E, F, N, R, and 7 trains. On the East Side of Manhattan, the Lower East Side and East Harlem have concentrations of low-income and minority residents, as do some portions of Brooklyn and the Bronx. At the same time, however, other portions of the East Side (such as East Midtown and the Upper East Side) have lower concentrations of these populations than many areas of the city. Overall, this impact would affect a broad range of people.

Noise

Following the guidelines of the Federal Transit Administration (FTA), the noise analysis considered effects on different categories of land uses. The analysis concluded that some impacts would occur to "Category 1" land uses, which are defined as "tracts of land where quiet is an essential element in the intended purpose. This category includes lands set aside for serenity and quite, and such land uses as outdoor amphitheaters and concert pavilions, as well as National Historic Landmarks with significant outdoor use." These uses are generally places that are visited or used by people from a broad geographical area, and therefore noise impacts on such uses would not result in significant impacts to any one population group.

The analysis also predicted noise impacts from increases in train service for sensitive residential uses along the project route ("Category 2"). As detailed in Chapter 11, these impacts were predicted along six LIRR branch segments: Woodside to Jamaica, in Queens; Jamaica to Valley Stream, just across the Queens-Nassau County border; Jamaica to Floral Park, also just across the Queens-Nassau border; Floral Park to Mineola, in Nassau County; Mineola to Hicksville, in Nassau County; and Huntington to Port Jefferson, in Suffolk County. For each of those segments, an analysis was conducted of the racial/ethnic and economic composition of populations living close to the rail line. Data were gathered on the block group level—the smallest census unit for which this information is available—to identify small concentrations of low-income or minority residents, if present.

Using a Geographic Information System (GIS) to link block groups with rail segments, census data for all residents in block groups adjacent to the six affected rail segments were collected. Populations in block groups farther from the rail line were not evaluated, because noise levels would drop off to below the impact threshold within 100 feet of the rail line at all locations. The results of the analysis are summarized in Table 18-3, which demonstrates that, overall, the block groups in which noise impacts would occur have an average population with minority and low-income populations similar to or smaller than the counties in which those block groups are located or the LITC as a whole. Figures 18-1 and 18-2 illustrate an overview of the census block groups with concentrations of minority residents and low-income residents throughout the LITC.

Block Groups with Minority Concentrations. Following the U.S. Department of Transportation's guidelines as well as census categories, this analysis considers minority population to include residents who are black; Asian and Pacific Islander; American Indian, Eskimo, or Aleut; and Hispanic. The U.S. census considers all but the Hispanic category to be racial groups, and the Hispanic group to be ethnic. Consequently, residents can be both Hispanic and black, or Hispanic and white, etc. To be conservative in identifying block groups with minority residents, a total percentage of minority residents was estimated by adding together all residents who are any of those racial groups or Hispanic, even though this involves some double-counting for Hispanic residents. The analysis then identified any block groups where 50 percent or more of the population belonged to one or more of those minority groups. These block groups are shown in Figure 18-1.

As shown in the figure, while there are a number of clusters of block groups with 50 percent or more minority residents in the LITC, the largest clusters are in four general areas of New York City—one of which would be affected by noise impacts from operation of the Preferred Alternative. Minority concentration block groups in New York City center around upper Manhattan, central Brooklyn, north-central Queens, and southeast Queens. While the project

Table 18-3

Population Affected by the Preferred Alternative—Noise Impacts

Location	Total Population	Race and Ethnicity (Percent)					Economic Profile	
		White	Black	Asians and Pacific Islanders	American Indians, Eskimos, or Aleuts	Hispanic*	1989 Median Household Income**	Percent Below Poverty Level***
Queens Impacted Population	86,751	42.6	38.5	12.3	0.3	16.2	32,126	14.4
Queens Total	1,951,598	57.9	21.7	12.2	0.3	19.5	34,186	10.8
Nassau Impacted Population	34,079	80.8	13.6	2.8	0.1	9.9	47,169	5.4
Nassau County Total	1,287,348	86.6	8.6	3.1	0.1	6.0	54,283	3.7
Suffolk Impacted Population	62,677	91.0	3.4	3.9	0.1	4.6	56,317	3.2
Suffolk County Total	1,321,864	90.0	6.3	1.7	0.2	6.6	49,128	4.6
Total Impacted Population	174,555	69.2	19.2	8.0	0.2	10.6	52,841	7.3
Total LITC	8,349,010	64.5%	21.8%	6.2%	0.3%	16.3%	$36,300	13.8%

Notes:

Impacted population is the total of residents within block groups closest to the impact locations.

* An ethnic group that can include members of all different racial categories.

** The median household income reported for the different impacted locations is a weighted average of those reported for the census and/or block groups in the study area. The median household income for the LITC is a weighted average of those reported for the counties in the LITC.

*** Percent of persons with incomes below the established poverty level; poverty level varies depending on household size.

Source: U.S. Department of Commerce, Bureau of Census, *U.S. Census of Population and Housing*, 1990.

avoids the three former clusters, the Jamaica to Floral Park and the Jamaica to Valley Stream LIRR segments do pass through Southeast Queens. In addition, the Sunnyside to Jamaica segment passes through a few scattered minority concentrated block groups.

In Nassau, the Mineola to Hicksville segment passes through a small cluster of block groups with minority concentrations, in the vicinity of the Village of Westbury. In Suffolk, the Huntington to Port Jefferson segment passes through a single minority concentrated block group near the Huntington Station.

As indicated on Figure 18-1, overall, the majority of minority concentrated block groups in the LITC would not be affected by noise impacts from the Preferred Alternative. Furthermore, the majority of noise impacts along these six segments of LIRR trackage fall upon block groups in which minorities do not make up the majority of the population.

Block Groups with Concentrations of Poverty. To determine the areas with a high proportion of low-income residents, the census block groups where 20 percent or more of the population was "poor" in 1990 (as defined by the 1990 US Census definition of poverty) were considered to have a concentration of poverty.* In comparison, 18.9 percent of New York City's residents overall are in this category, so the use of 20 percent is conservative for this analysis. Figure 18-2 shows block groups with concentrations of poor residents.

While concentrations of poverty are less clustered than concentrations of minorities, there are still areas that exhibit clusters of block groups with concentrations of poverty. In Nassau and Suffolk Counties, there are few such areas, but in New York City, clusters exist in much of Brooklyn (especially central Brooklyn) and in Upper Manhattan.

As indicated on Figure 18-2, similar to the case for block groups with concentrations of minorities, overall, the majority of block groups with concentrations of poverty in the LITC are not affected by noise impacts from the Preferred Alternative. Furthermore, the majority of noise impacts along these six segments of LIRR trackage fall upon block groups in which poor people do not make up 20 percent of the population.

CONCLUSIONS REGARDING ENVIRONMENTAL JUSTICE

Overall, the impacts of the Preferred Alternative that could not be fully mitigated would not be disproportionate. While impacts would occur in some locations with concentrations of low-income and minority residents, similar impacts would occur in other locations with populations without those concentrations. Figures 18-1 and 18-2 illustrate that the project's noise impacts are not concentrated in areas with low-income and minority populations, and Table 18-3 further demonstrates that areas affected by noise impacts, on average, have proportions of low-income and minority residents similar to or smaller than the counties in which they are located or the LITC as a whole.

Furthermore, the project would provide substantial benefits that would affect the same broad range of people that would experience the project's impacts. For example, residents of Long Island who might experience noise impacts could also benefit from the improved service on the

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* (Due to difficulties in gathering data on a block group level for the 1990 US Census category "Persons Below Poverty Level," data for the category "Poor Persons" was used instead. These two categories, while defined slightly differently, yield percentages that are statistically indistinguishable.)

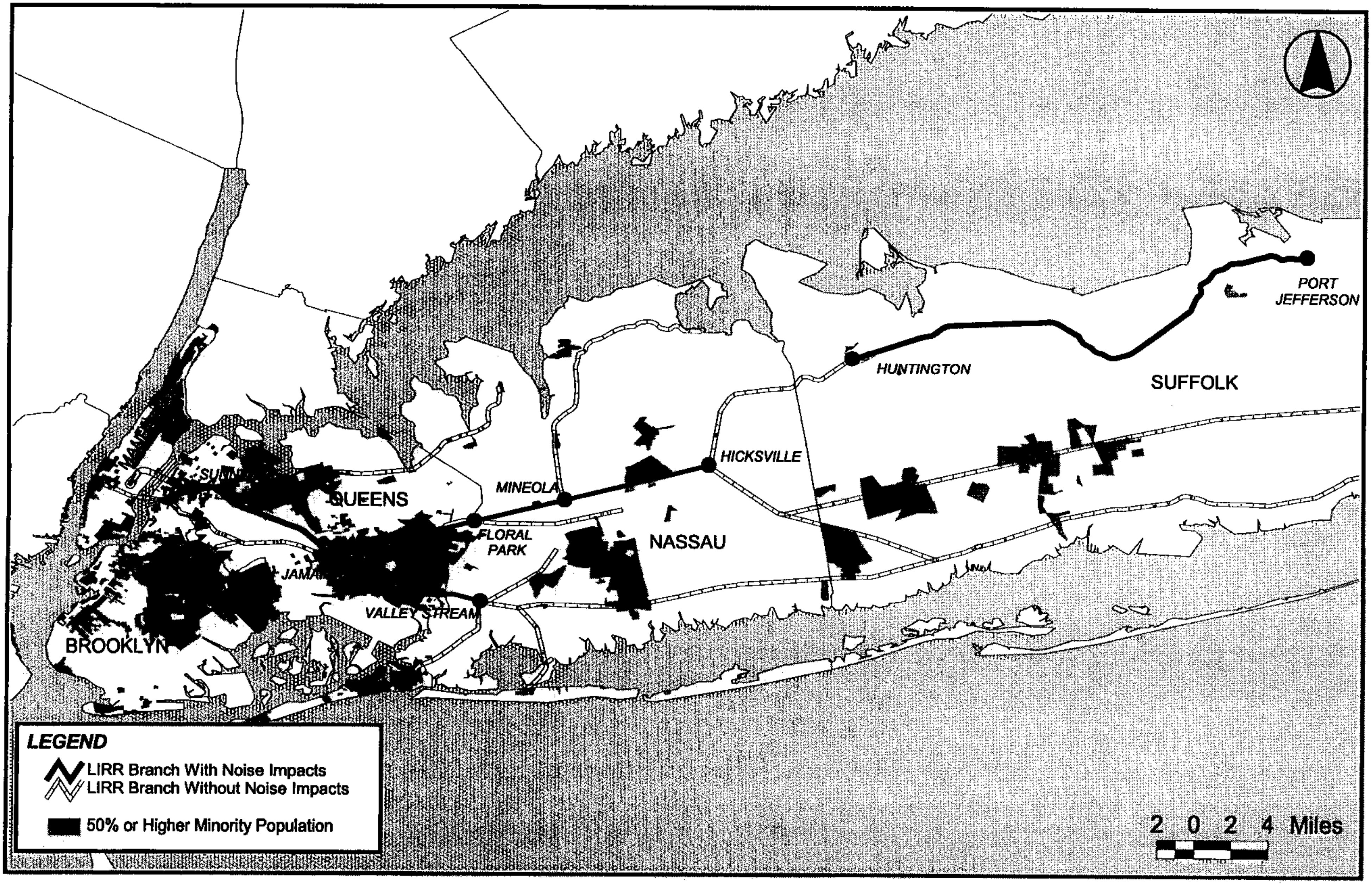
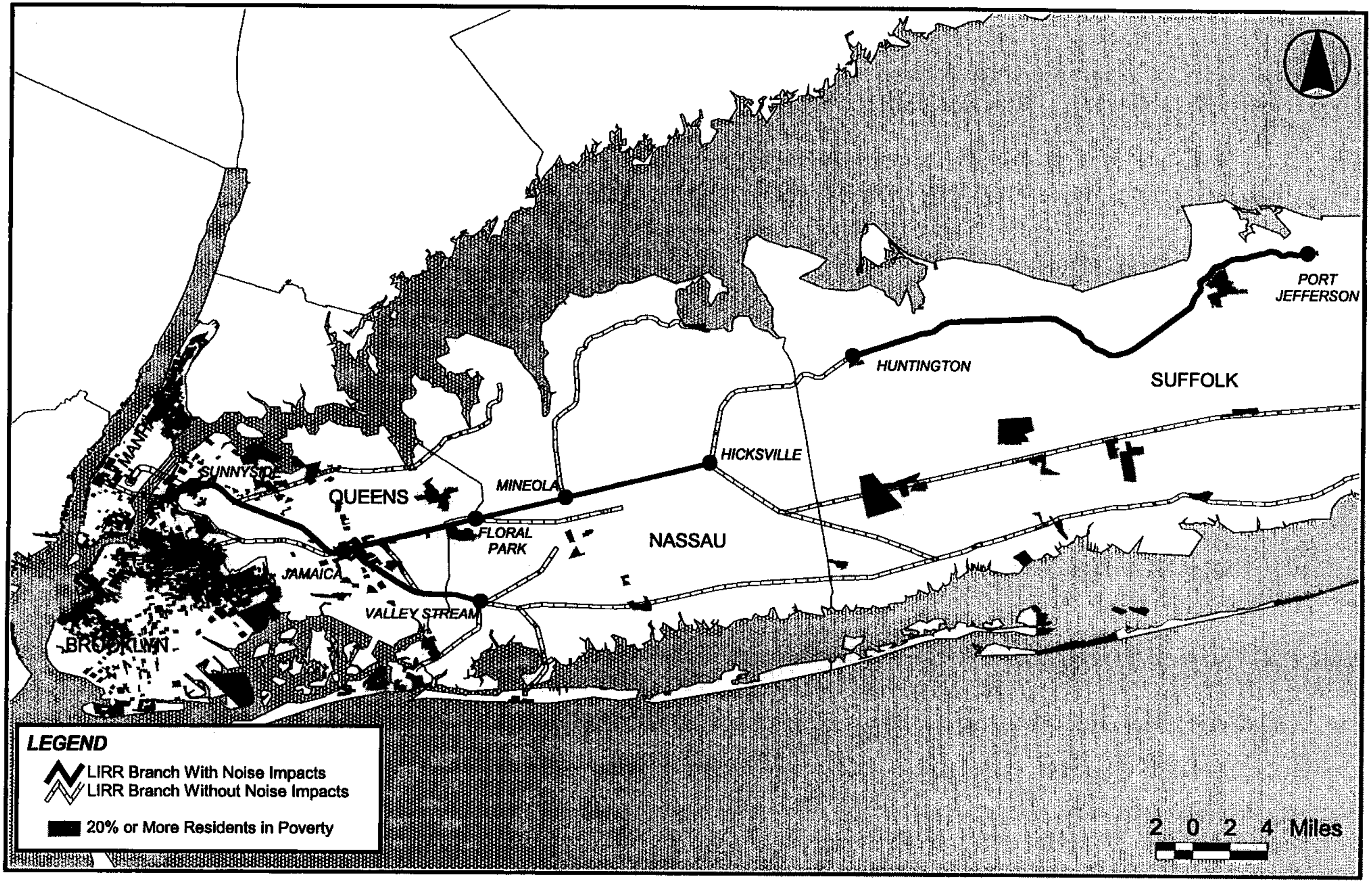


Figure 18-1

Block Groups with Minority Concentrations: Long Island Transportation Corridor, 1990



MTA / LIRR

East Side Access

Figure 18-2

Block Groups with Concentrations of Poverty: Long Island Transportation Corridor, 1990

LIRR. In New York City, impacts to the Lexington Avenue subway line would be offset by substantial decreases in crowding on other subway lines, particularly subways serving Queens. The project would also result in decreases in vehicle miles traveled, and associated decreases in air pollutants, throughout the LITC as well as in the Bronx.

On balance, the significant unmitigated impacts of the Preferred Alternative would not disproportionately affect low-income or minority populations. ⁂

Chapter 19: Secondary Effects

A. INTRODUCTION

Secondary impacts are those that are "caused by an action and are later in time or farther removed in distance but are still reasonably foreseeable" (40 CFR 1508.8). Generally, these impacts are induced by the proposed project. Secondary effects can occur within the full range of impact types, such as changes in land use; economic vitality; neighborhood character; traffic congestion, with its associated effects on air quality and noise; water resources; and other natural resources.

Chapters 3 through 18 assess the potential primary and secondary effects of the No Action, TSM, and Preferred Alternatives for a range of technical areas. This chapter summarizes secondary effects of the project alternatives and addresses cumulative effects of the alternatives in combination with conditions as set forth in "Future Conditions Common to All Alternatives" section of the previous chapters, plus other reasonably foreseeable actions that are not yet to the point where they have been included in capital budgets or identified in the long-term planning of transportation agencies.

B. SECONDARY IMPACTS

As outlined in Chapter 1, "Project Purpose and Need," an important goal of the East Side Access Project is to produce beneficial secondary impacts in the Long Island Transportation Corridor (LITC) and the New York metropolitan region. These are primarily sustained regional economic growth, a trend towards more efficient development patterns, and reduction in use of the automobile. The adverse secondary effects of the project alternatives identified in the previous chapters arise from changes in train service and localized commuting patterns and relate to land use, social conditions, economic conditions, transportation, and air quality. In comparing secondary effects among alternatives, the relevant assessments in Chapters 3 through 5, 9, 10, and 12 clearly demonstrate that only the Preferred Alternative would generate significant beneficial secondary impacts and that its secondary adverse impacts could be mitigated, as summarized below.

LAND USE, ZONING, AND PUBLIC POLICY

The East Side Access Project is not expected to have major effects on land use. As discussed in Chapter 3, the LITC is substantially developed. In Manhattan, both Grand Central Terminal (GCT) and Penn Station lie within the Midtown commercial center, surrounded by dense, predominantly commercial uses. Although the project could make the area around GCT more attractive as a commercial district, it is an extremely desirable area now, but with few sites available for development. At Penn Station, the diversion of LIRR riders to GCT would have only minor, localized effect. Under the No Action and TSM Alternatives, these passengers would arrive in Penn Station, but travel to the area near GCT to reach their destinations.

As noted in Chapter 3, the Preferred Alternative's Sunnyside station would support the city's plans to create a Central Business District (CBD) in Long Island City. However, the ultimate success of the new CBD would depend primarily on public policy (to permit it and perhaps grant incentives for development) and economic trends. The project alternative's role would be supportive, but not critical. The No Action and TSM Alternatives would offer no beneficial secondary impact in Long Island City. None of the project alternatives would affect land uses in the areas surrounding the yard sites.

Secondary effects of the Preferred Alternative on land use on Long Island would be generally beneficial. By attracting new patrons to the LIRR, this alternative would reduce congestion on the area's highways, resulting in improved access to land uses. The alternative would clearly generally support county land use policies that seek to concentrate future growth in established areas, make efficient use of the transportation network, and revitalize existing town centers. Increased patronage on the LIRR would support land uses around local train stations and focus development on town centers, promoting a more efficient and centered land use pattern. The No Action and TSM Alternatives would provide no such beneficial secondary land use impact on Long Island. Development patterns would continue as urban sprawl with no impetus to alter land use patterns.

On a regional level, secondary land use/development effects of the No Action Alternative and even the TSM Alternative could actually be adverse. The increases in population and employment—and the development to support these increases—predicted for 2010 and 2020 are based on the assumption that transportation services would not deteriorate during this time. If under the No Action or TSM Alternative transportation service does indeed deteriorate, then the anticipated growth may not be achieved. On Long Island, where there is still substantial development potential, the potential effects of the No Action Alternative would be most apparent. Under the Preferred Alternative, there would be no rail transportation-related impediment to anticipated growth.

SOCIAL CONDITIONS

Secondary effects on social conditions from the project relate to changes in service and access for the area's residents and workers, access and support to community facilities and recreational opportunities, and community character. As discussed in Chapter 4, in general, the No Action Alternative would result in adverse secondary effects on social conditions throughout the LITC, the TSM Alternative's effects would be somewhat less adverse, and the Preferred Alternative would generate beneficial secondary effects, as described below. The project alternatives would not affect social conditions in the areas surrounding the yard sites.

With a potential deterioration in rail transit service predicted under the No Action Alternative, access to the region's community facilities, workplaces, homes, and areas of commerce would become more difficult and inconvenient. On Long Island, where use of the LIRR is strongest, the decrease in quality of LIRR service would be felt most strongly. This change would inconvenience all study area residents and support the trend toward an area characterized by increased dependence on the automobile. A portion of the labor force living on Long Island would be more likely to seek jobs outside the region's commercial center in New York City. The railroad's influence on land use trends would weaken, resulting in a stronger trend toward sprawling development and auto-dependent land use patterns. This is likely to have an adverse impact on efforts to preserve community character in areas that depend on the LIRR. Within Manhattan, the potential increase in Penn Station passengers making their way across town to and from their jobs on the East Side would add to congestion and detract from community character as well.

The TSM Alternative would slightly improve transportation service to East Midtown Manhattan, and therefore would result in small decreases in congestion in Midtown. Overall, however, the TSM Alternative would have little effect in terms of strengthening the CBD or improving access to regional community facilities. By offering some increase in capacity for commuter service on the LIRR, the TSM Alternative would cause less inconvenience to residents of Long Island than the No Action Alternative, but it would not abate the trend toward a neighborhood character more strongly characterized by dependence on the automobile.

In contrast, by greatly improving service to Manhattan from eastern Queens and Long Island, and by adding origin/destination options (GCT and Sunnyside station), the Preferred Alternative would benefit all corridor residents and would improve access to the region's community facilities. Those residents of Long Island and Eastern Queens who commute on the LIRR would experience the greatest benefit. However, since the LIRR serves the region's community facilities, all residents would benefit. In addition, because the Preferred Alternative would succeed in diverting to the LIRR some commuters who would otherwise drive to work, it would support transit-centered development and help to shift the trends that currently favor suburban sprawl and automobile dependence.

ECONOMIC CONDITIONS AND RELOCATION

As discussed in Chapter 5, the direct displacement and required relocation of employment and businesses as a result of the Preferred Alternative is not expected to engender indirect, or secondary impacts. Secondary economic effects of the project on the LITC and study areas are, like those of land use and social conditions, related to the changes in transportation service and commuting patterns. Again, the No Action Alternative's potential secondary effects would be adverse, the TSM Alternative's less so, and the Preferred Alternative's beneficial, as summarized below. There would be no effect on economic conditions in the areas surrounding the yard sites.

Since the projections of population and employment for the LITC assume no deterioration in transportation service, under the No Action Alternative, with its decline in service, these predicted growth levels might not be achieved. On Long Island, this could mean fewer new residents and possibly lower employment with a concomitant effect on the future local tax base and economic activity. In addition, commuters might adjust their travel patterns to compensate for deteriorating service on the LIRR, with economic impacts on the broader community exacerbating already congested conditions on major roads leading from Long Island to Manhattan.

Such a shift would increase congestion on the roads, increasing the time required for the journey to work by non-transit users, and slow the delivery of goods and services over roads throughout the region. This is turn would increase the cost of doing business, ultimately making the LITC a less desirable location for business. Thus, the No Action Alternative could affect the attractiveness of the LITC, and particularly Manhattan, as a business location, undermining the projected employment growth for the region and the economic demand that would be generated by future employees.

The modifications proposed under the TSM Alternative would improve the journey to work for some LIRR commuters, and secondarily improve the movement of goods and services through the region. However, the improvements would not be sufficient to avoid the overcrowding and delays that are likely to occur in the future, and the existing disconnect between the location of jobs and the location of terminals would not be substantially improved by the implementation of the TSM Alternative.

The Preferred Alternative would create two major improvements in the LIRR infrastructure that would have significant beneficial impacts on the region's economy: the provision of new LIRR service to a new LIRR terminal at GCT and the creation of a new LIRR station in Sunnyside, Queens. The direct impacts from these improvements would be the elimination of the existing disconnect between the location of jobs and location of terminals, as well as substantial relief from the currently overcrowded conditions on many LIRR peak hour trains, and considerable reduction in the time required for the journey to work. Non-LIRR users would also benefit, since the diversion of auto commuters to the train would reduce congestion on the major Long Island roadways leading to Manhattan.

With the Preferred Alternative, the rail transit system would be adequate to serve the region with the economic growth that is currently projected. Therefore, compared with the No Action Alternative the Preferred Alternative would have a clear positive secondary impact on productivity within the LITC, and particularly in Manhattan. Eliminating the disconnect between the locations of jobs and the LIRR terminals, improving transportation service, reducing travel time, and improving the quality of life would provide the transportation support that is needed for the region, particularly Manhattan, in light of its projected growth in employment. Research suggests a strong correlation between infrastructure investment and more openings of new businesses, as well as expansions of existing businesses. The investment proposed under the Preferred Alternative would count heavily to support the LITC and Manhattan, in particular, as a viable location for business growth. As noted in Chapter 5, achieving the employment projections for Manhattan would generate about $26 billion in new annual earnings (wages and salaries) by 2020 in today's dollars, as well as considerable secondary spending and employment impacts throughout the state.

As another secondary effect, there would be changes in spending patterns at the two Manhattan LIRR terminals, with spending increasing at GCT's retail businesses and services and decreasing at Penn Station. Neither the increase or decrease in spending would constitute a significant secondary impact.

The location of a new LIRR station in Sunnyside would increase accessibility to the area for the Long Island work force. Expanding direct links to the work force in a wider region would make Long Island City a more attractive location for the growing service industries in the area, particularly business services, since a larger labor pool with a broader range of skills would be more readily accessible. In the long run, the Preferred Alternative would enhance opportunities for future development in Long Island City, where nearly 4 million square feet of office space are currently planned. In addition, the combination of midday railcar storage and the proposed new station would very likely increase employment, and thus consumer expenditures by railroad employees as well as new LIRR commuters.

Long Island would also benefit from the Preferred Alternative. The attraction of an area as a business location is not only based on the transportation infrastructure, but also on the availability of the work force. Since transportation on Long Island is problematic in every mode, investing in LIRR infrastructure is likely to improve the quality of life on Long Island for users and non-users of the system alike, i.e., improved rail service would also reduce traffic congestion, both of which would support the attraction of Long Island as a desirable residential location. Population growth (and thus, growth in the work force) and employment growth projected for Long Island would be more readily achievable under the Preferred Alternative.

In addition, transit-oriented communities on Long Island may benefit from the improved LIRR service to Midtown Manhattan. Recent studies have provided evidence of a tangible correlation between transit accessibility and higher residential property values. However, the value of residential property is affected by a number of factors, including the amenities of the community, prevailing interest rates, availability of housing, levels of economic activity, the location of properties relative to other land uses, the proximity to retail centers, and the quality of the public education system.

TRANSPORTATION

OVERVIEW

In considering secondary transportation effects of the project alternatives, only the Preferred Alternative, which proposes substantial changes in service leading to measurable changes in commutation patterns, would generate impacts (see Chapter 9). The No Action Alternative and TSM Alternative would generally not create significant secondary effects, except as noted in the discussions below.

In terms of regional travel, the Preferred Alternative would provide an overall significant beneficial secondary effect by improving transportation service from Long Island and eastern Queens to Manhattan and Queens. It would provide commuters destined for Manhattan with increased and improved train service—there would be more trains into Manhattan, greater availability of seats, and the flexibility to get directly to the East Side of Midtown Manhattan in addition to the West Side. It would reduce auto commutation into Manhattan as well, by diverting auto trips from eastern Queens and Long Island, to the LIRR. Overall, the Preferred Alternative would reduce total daily vehicle miles traveled (VMT) by about 342,000 in 2010 and by 375,000 in 2020. There would be 11,000 fewer daily auto trips to work in 2010, and 12,000 fewer daily trips in 2020. Background traffic in the overall Midtown area would decrease by 2 percent, and parking demand in Manhattan would decline by approximately 3,000 vehicles or more on a typical weekday.

At the same time, the project could result in localized effects on other transportation elements. These would include the potential for increased traffic at intersections surrounding GCT, where the number of taxis would increase. These effects would also include increased traffic and parking at LIRR stations in eastern Queens and on Long Island, where the number of riders is projected to increase because of the Preferred Alternative.

GRAND CENTRAL TERMINAL AND SURROUNDING AREA

In the area surrounding GCT, all of the local traffic impacts could be mitigated with standard traffic improvement measures, such as signal phasing and timing modifications, more restrictive parking regulations, and by providing exclusive phases for turning movements at some intersections where there are significant conflicts with high volumes of pedestrians.

Other local effects of the Preferred Alternative would include both increases and decreases in ridership and related impacts on subways serving GCT. Ridership on the Lexington Avenue line would rise. There would be increases in the number of pedestrians in and around the terminal. The subway impacts include overcrowding on several subway station elements (e.g., stairs, escalators, entrances, etc.) and an increase in demand on the "line haul," or the number of passengers on the trains entering and leaving the station during the peak hours. Mitigation of the subway impacts includes a series of improvements to increase usage of currently underutilized areas within the transit system such as the "free" passageway connecting the 42nd Street Shuttle with the Lexington Avenue line, strategic placement of control agents to divert passenger flows to paths with available capacity, new stairwells, additional turnstiles, and removal of impedances to smooth passenger flows on the subway platforms. The overall mitigation strategy aims at generating more balanced use of passageways, stairwells and escalators to create a more balanced distribution of passengers to, from, and within the subway station. Certain elements could be mitigated fully while others only partially.

The increases in pedestrian flows in GCT would not result in significant adverse secondary impacts. In one location, it is recommended that an existing escalator bank, which operates with one escalator up and one down at all times, be operated with both escalators up in the AM peak period and both down in the PM peak period to accommodate increased pedestrian activity.

In the area surrounding GCT, the secondary effects of increased pedestrian flow would be limited to locations near GCT, since most of these passengers would travel to the area from Penn Station under the No Action and TSM Alternatives. Still, the assessment in Chapter 9 found that there would be significant impacts requiring mitigation at several locations. Some 15-foot-wide crosswalks would need to be widened to 20 feet. At some locations, street furniture and other impediments to pedestrian flow would need to be cleared or limited. This could include sidewalk vendors, newspaper kiosks, and flower boxes, for example. Quick, steady removal of refuse bags that often line sections of sidewalk in Midtown would also be needed.

With the Preferred Alternative there would be reduced demand for several bus routes that connect Penn Station with the East Side, since LIRR commuters could take direct LIRR service to GCT. There would also be some ridership increases on East Side bus routes by LIRR commuters arriving at GCT who would need to transfer to other routes to get to their final destinations. It is NYCT's policy to adjust bus schedules and frequencies as demand dictates.

The increases in pedestrian, subway, and taxi activity at GCT would be offset by decreases in such activity in the Penn Station area, where passenger movements would be less congested, vehicle traffic on the street network would be less congested, and crowding in subway stations and on subway lines would be eased.

LONG ISLAND CITY/SUNNYSIDE AND FLATBUSH AVENUE TERMINAL

The Preferred Alternative would generate a relatively small number of new LIRR riders at its proposed Sunnyside station during the peak commuting periods. It is anticipated that 90 percent of these LIRR commuters at Sunnyside would walk to their final destination in the area after alighting from LIRR trains, that 9 to 10 percent would transfer to subways or buses, and that less than 1 percent would take taxis or be picked up or dropped off by car. Significant adverse traffic and transportation impacts are not expected.

Under the TSM Alternative additional LIRR commuters would arrive at the Hunters Point Avenue terminal station, the vast majority of whom would then transfer to westbound IRT No. 7 Flushing line trains to Manhattan's East Side at the No. 7 line's Hunters Point Avenue station. These No. 7 trains are already operating at capacity, without room for additional passengers. A few new LIRR riders are projected to use the very infrequent LIRR service to its Long Island

City station; many of these riders would also transfer to the No. 7 line at its Vernon-Jackson station.

Under the TSM Alternative additional LIRR riders would travel to the Flatbush Avenue terminal in downtown Brooklyn and transfer to the northbound Nos. 4, 5 or 6 lines. Those lines are also subjected to serious crowding levels, and the addition of new LIRR commuters there would exacerbate those conditions.

EASTERN QUEENS AND LONG ISLAND

The analysis of potential impacts at LIRR stations focused in detail on 15 of the LIRR's stations in eastern Queens and Long Island, representing the range of all stations, including several of the busiest stations and others with more moderate usage, stations within local business districts and others closer to residential areas or in fringe areas, stations with multiple bus routes and others with limited service, and stations with extensive parking capacity and others with very limited parking availability. Potential traffic impacts were examined at the representative stations, while parking impacts were evaluated at all stations.

Traffic

Analysis of traffic conditions found several intersections with the potential for significant impact under the Preferred Alternative. All of these impacts could be mitigated via standard traffic engineering improvements, such as the installation of traffic signals at unsignalized intersections, signal phasing and/or timing modifications at signalized intersections, lane re-striping, offsetting centerlines of streets to gain additional capacity in one direction, and more restrictive parking regulations. These are standard measures within the day-to-day jurisdiction of the agencies responsible for maintaining traffic operations. Since the detailed traffic impact analyses were conducted for a representative set of stations, standard traffic engineering improvements would likely be sufficient to mitigate traffic impacts that might occur at any of the LIRR's numerous other stations. At one grade crossing, the mitigation would relate to the timing of the crossing gate.

Parking

The Preferred Alternative can be expected to increase parking demands at each of the LIRR's 124 stations. Several stations would be able to accommodate the demands, while others would experience significant parking shortfalls (in many cases, parking shortfalls would be expected even under the No Action Alternative). Depending on the individual station in question, mitigation of these shortfalls would include: expansion of existing lots or construction of new lots or garages; modification of train service and schedules to increase service at stations with available parking or where parking could be added more easily; institution of fare policy changes to attract riders to a new station by shifting one or more stations from one fare zone to another; increasing bus service or heavily subsidizing bus fares; implementation of new feeder bus services; improving kiss-and-ride facilities to increase pickup and drop-off activity rather than parking; providing preferential parking areas for car-poolers, with enforcement; construction of new stations near or between two major stations where parking demands greatly exceed parking availability; promoting bicycle use; and others. Ridership and parking projections would need to be closely monitored, and the LIRR would need to be ready to implement one or more of these strategies at individual stations.

AIR QUALITY

Air quality effects of the project are "secondary" and result from changes in traffic patterns induced by modifications to travel patterns associated with the project (see Chapter 10). The Preferred Alternative would generate two types of secondary air quality effects—regional ("mesoscale") changes in vehicular miles traveled and related pollutant burdens of carbon monoxide, volatile organic compounds, compounds of nitrogen and oxygen, and small particulate matter; and localized ("microscale") increases or decreases in pollutants associated with automobiles, represented by the analysis of carbon monoxide concentrations at specific sites. The TSM Alternative would affect only regional air quality, since it would have no effect on local traffic conditions near GCT, and minimal effects in Sunnyside and some at LIRR stations.

As shown in Table 10-8, above, the Preferred and TSM Alternatives would reduce pollutant burdens attributable to the automobile compared to the No Action Alternative, with the Preferred Alternative's reductions equaling between 3 and 5 times that of the TSM Alternative. The TSM Alternative would increase pollutant burdens produced by the operation of diesel trains. In total, the Preferred Alternative would show beneficial secondary effects on regional air quality. The TSM Alternative would have beneficial effects on all but nitrogen oxygen compounds.

The air quality analysis in Chapter 10 found that the Preferred Alternative would have an impact on air quality at one location: Madison Avenue and 48th Street. The concentration of carbon monoxide would remain within standards, but the increase over the No Action condition is considered to be significant. This impact would be mitigated by proposed traffic mitigation at that location.

ENERGY

Secondary energy impacts of the project are associated with traffic-related energy use. As discussed in Chapter 12 and shown on Table 12-1, the change from auto use to LIRR travel for the journey to work under TSM and Preferred Alternatives would reduce travel-related energy consumption. The TSM Alternative would reduce annual VMT by 33.3 million miles, resulting in a 177 billion BTU reduction in energy consumption. The Preferred Alternative would reduce total VMT by 100.4 million miles, but adding energy consumption from additional electric trains, thus generating a net reduction in energy consumption of 151 billion BTU.

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A. INTRODUCTION

The project alternatives for the East Side Access Project were identified as part of the Major Investment Study (MIS) through a comprehensive planning process that developed alternatives and evaluated them against project goals and objectives, and a number of other criteria to focus in and ultimately determine a Preferred Alternative. This chapter summarizes the alternatives identified and evaluated during the MIS phase of project planning.

Development and evaluation of alternatives in the MIS was a comprehensive process, involving consideration of the universe of alternatives that might meet Long Island Rail Road (LIRR) goals for the Long Island Transportation Corridor. To bring focus to the evaluation, it was performed in two stages. Once all options were identified, these "long list" alternatives were screened for their performance in meeting project goals and their potential for technical and operational feasibility. The remaining "refined list" alternatives that did not fail the screen were subject to a more detailed evaluation, so that project alternatives for further review in the EIS could be identified.

B. IDENTIFYING ALTERNATIVES

The identification of alternatives that could meet the project goals began in January 1995, through an MIS sponsored by the LIRR and carried out under the auspices of the Federal Transit Administration (FTA), the New York Metropolitan Transportation Council (NYMTC), and the Metropolitan Transportation Authority (MTA). The process involved several years of discussions, outreach, scoping meetings, and research geared toward developing scenarios that would improve transit access to the East Midtown Manhattan and increase the capacity of the LIRR. Above all, the project strove toward establishing ongoing dialogue among sponsoring agencies, private consultants, and the community.

The project team began by reviewing a host of reports published by public and private agencies and organizations, and convened public meetings and brainstorming sessions both large and small. Group presentations were prepared, ideas were solicited, and public concerns and comments were documented throughout the process. A Technical Advisory Committee aided in the review of technical data, and a Citizens Advisory Committee provided a formal mechanism for obtaining a broad base of community input relating to project goals.

These efforts elicited a wide variety of ideas for improving access to the east side of Manhattan—from building a new rail terminal in East Midtown, to running LIRR trains on Manhattan

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[*] The description of the long list of alternatives presented here, along with the evaluation of the long and refined list of alternatives, is a summary of information from the Major Investment Study for the Long Island Transportation Corridor (April 1998) and its associated Appendices. Please refer to the MIS for additional detail.

subway lines, to expanding subway service beyond New York City limits. With all of these accumulated ideas and thoughts in mind, the project team compiled a preliminary list of alternatives designed to capture the universe of ideas about how to improve access to East Midtown Manhattan. This was the "long list" of project alternatives. The first step in alternatives evaluation was to screen the long list candidates for their ability to meet project goals and their overall feasibility, as described below.

C. SCREENING THE LONG LIST OF ALTERNATIVES

The long list consisted of 21 separate "Build" alternatives, plus two alternatives required for consideration under National Environmental Policy Act (NEPA) regulations: the No Action Alternative, which includes improvements to the transportation system that would be implemented regardless of the construction of East Side Access; and the Transportation Systems Management (TSM) Alternative, which consists of transportation improvements that could be implemented without intensive capital expenditures. Regulations require that any selected alternative be evaluated in comparison with both the No Action and TSM Alternatives. As such, these two alternatives were not subject to the MIS screening of "long list" alternatives and are discussed separately below, followed by a summary of the screening of long list alternatives.

THE NO ACTION AND TSM ALTERNATIVES (ALTERNATIVES 1 AND 2)

Both the No Action and TSM Alternatives represent the options that a decision-maker could take other than major construction. As such, they were not subjected to the screening procedures, but remained for comparison during the detailed evaluation and for consideration in the EIS. Because transportation plans have changed over time, the two alternatives, as they are described in the MIS, are the same in concept, but different in their components from the two alternatives of the same name in this DEIS.

Essentially, the No Action Alternative consists of all transportation system improvements that are planned and funded for construction or operation by 2020—the MIS forecast year. Since the MIS was completed, some projects have already been completed (and are now incorporated as "Existing Conditions"), some new projects have been planned, and still others have been delayed beyond 2020.

The TSM Alternative comprises a set of low-cost measures designed to improve the transportation system. Some of the TSM components defined in the MIS have already been constructed, making them part of existing conditions. Others have been adopted as plans and are now included in the No Action Alternative. Others have evolved and new components have been added since the MIS. The up-to-date versions of these alternatives that form the basis of the EIS analyses are described in Chapter 2 "Project Alternatives."

SCREENING OF THE LONG LIST BUILD ALTERNATIVES

The first screening of "long list" alternatives eliminated any alternative that either did not meet the project's two critical study goals—to reduce travel time to East Midtown Manhattan and to relieve train traffic congestion at Penn Station—or was deemed either technically or operationally infeasible. In order to conduct the initial screening, the project team examined each long list alternative. Information was gathered and organized in the following categories: right-of-way requirements, track work, utilities, structures/tunnels, traction power, signals and communications, stations, parking, maintenance facilities/depots, vehicles, operating plans, impact on other operators, environmental issues, and community issues/concerns, among others. Each alternative and its first screen evaluation are described below (see also Table 20-1). The names of each alternative are adaptations of names used in the MIS, while the numbers for each alternative have been retained from the MIS.

Table 20-1
Screening of Long List Alternatives

Alternatives	Meets Study Goals	Technically Feasible	Operational Issues		Further Evaluation?
			Sufficient Capacity	Institutionally and Operationally Feasible	
1. No Action	▨	▨	▨	▨	Yes
2. TSM	▨	▨	▨	▨	Yes
3. Express Bus/HOV Lane*	No	Yes	No	Yes	Yes
4. LIRR East Side Terminal					
A. GCT via the Main Line	Yes	Yes	Yes	Yes	Yes
B. GCT via the Montauk Branch	Yes	Yes	Yes	Yes	Yes
C. Third Avenue via the Main Line	Yes	Yes	Yes	Yes	Yes
D. Third Avenue via the Montauk Branch	Yes	Yes	Yes	Yes	Yes
5. East Side Rail Station	No	Yes	No	No	No
6. East Side Rail Station with New East River Tunnel*	Yes	Yes	No	No	Yes
7. Sunnyside Transfer Station					
A. Queens Plaza**	Yes	Yes	Yes	Yes	No
B. Harold Interlocking	No	No	No	No	No
C. 42nd LRT to Sunnyside	Yes	Yes	No	No	No
D. Long Island City Intermodal	Yes	Yes	Yes	Yes	Yes
8. Subway Operation Over LIRR Tracks					
A. Port Washington Branch	No	Yes	Yes	No	No
B. Inner Port Washington and Rockaway Beach Branches	No	Yes	Yes	No	No
C. Atlantic Branch	No	Yes	Yes	No	No
D. Atlantic Branch Shuttle	No	Yes	Yes	No	No
9. LIRR Operation Over NYCT Tracks					
A. Port Washington Branch/BMT	No	Yes	Yes	No	No
B. Port Washington Branch/IND	No	Yes	No	No	No
C. Atlantic Branch to IND	No	Yes	No	No	No
D. Atlantic Branch—Clockwise	No	Yes	No	No	No
E. Atlantic Branch—Counter-Clockwise	No	Yes	No	No	No
F. Atlantic Branch to Fulton Street Line	No	Yes	No	No	No

Notes:

* These alternatives passed to more detailed evaluation by exception. See text discussion.

** Similar to Long Island City Intermodal Alternative, but not as beneficial. See text discussion.

NON-RAIL ALTERNATIVE: BUS/HOV LANE (ALTERNATIVE 3)

This Build Alternative proposed surface transit as an alternative to rail transit. It provided for the operation of new express bus service along the Long Island Expressway (LIE). Express buses would run in each direction along High Occupancy Vehicle (HOV) lanes—some existing and some to be constructed by the New York State Department of Transportation (NYSDOT)—from the Van Wyck Expressway (Exit 22) in Queens, to Medford (Exit 64) in Suffolk County, and along normal LIE lanes east of Medford.

In the AM peak hour[s], buses would run westbound on LIE HOV lanes to the Van Wyck Expressway, via normal lanes from the Van Wyck and via express bus lanes from approximately 108th Street in Corona, Queens to the Queens-Midtown Tunnel. From the tunnel, buses would run north on Third Avenue to 57th Street. In the PM peak period, following New York City Department of Transportation policy (NYCDOT) to avoid excessive congestion in the Queens-Midtown Tunnel and backup on tunnel entrances, buses would run north on Third Avenue from 42nd Street, over the Queensboro Bridge, along Queens Boulevard to the LIE, and east along the LIE in HOV lanes to Medford; and then in normal lanes to Riverhead. Construction of HOV lanes would be accompanied by construction of bus shelters and park-and-ride lots at major LIE interchanges.

This alternative did not pass the first screen for a number of reasons. It did not meet the critical study goal of relieving train traffic congestion at Penn Station because it would not have had the capacity to divert enough riders from the LIRR to reduce the number of trains at Penn Station. Moreover, the alternative's operational feasibility was questionable because it was likely to increase traffic congestion along some sections of the route, particularly in Manhattan and at the river crossings. Despite this essential flaw, the Bus/HOV Lane Alternative was retained for evaluation in the second stage. This was done to enhance the overall review process, enabling transit and highway administrators to consider a surface transit alternative in the evaluation.

LIRR EAST SIDE TERMINAL ALTERNATIVES

Four alternatives in the long list provided for improved LIRR access to East Midtown Manhattan through the lower level of the existing 63rd Street tunnel to a terminal in East Midtown. Each of the following alternatives also provided for the construction of a new LIRR station (Sunnyside Station) in the vicinity of Thomson Avenue in Queens. Two sets of the four alternatives differed in how they would connect to the 63rd Street tunnel, and two sets differed in where they would terminate in Manhattan, as described below.

Grand Central Terminal (GCT) via the Main Line/Port Washington (Alternative 4A)

This alternative would construct access in the vicinity of Sunnyside Yard to the 63rd Street tunnel and would also construct a tunnel starting at Second Avenue and 63rd Street, curving over to and down Park Avenue, to terminate at a new track area in GCT.

GCT via Montauk/Port Washington (Alternative 4B)

This alternative was similar in concept to the alternative above, except that it would connect the Montauk Branch, instead of the Main Line, to the 63rd Street tunnel route. This would involve electrification of portions of the Montauk Branch and the construction of an 8,000-foot elevated structure in the vicinity of Sunnyside Yard.

Third Avenue Terminal via the Main Line/Port Washington (Alternative 4C) and Third Avenue Terminal via Montauk/Port Washington (Alternative 4D)

Both of these alternatives offered the same variations in Queens as the above alternatives, but would have terminated in a new, underground East Midtown Terminal to be built under Third Avenue between 42nd and 52nd Streets. This terminal location was examined because it had been proposed in a number of previous studies for the LIRR.

Screening

All four of these alternatives offered faster access to East Midtown and relieved congestion at Penn Station. Initial examination found them to be technically and operationally feasible. Thus, they all "passed" the first stage evaluation and proceeded to the second, more detailed evaluation stage.

LIRR EAST SIDE STATION ALTERNATIVES

These two alternatives used the LIRR's current train path to Penn Station along 32nd and 33rd Streets, but added a rail station in East Midtown between Third and Madison Avenues. This station would have been a stop along the route into Penn Station.

East Side Station (Alternative 5)

This alternative proposed to widen existing tunnels between Second and Sixth Avenues to accommodate a new station on a passing siding. This would have allowed the LIRR to stop trains at the station or institute routes with no East-Side stop. The station would have had a connection to the Lexington Avenue No. 6 train (local service) at its 33rd Street station on Park Avenue.

East Side Station with New East River Tunnel (Alternative 6)

This alternative proposed to construct a new, two-track East River tunnel just south of existing tunnels, to be used by NJ Transit and Amtrak for connections to and from Penn Station. With exclusive use of the existing tunnels, the LIRR could increase capacity of the line to Penn Station and build a station in East Midtown without widening the existing tunnel. This station, too, provided a connection to the No. 6 train.

Screening Summary

The East Side Station Alternative would not have relieved—and very well could have aggravated—congestion at Penn Station by creating new restrictions to train movements. As such, it failed the first screening and was eliminated from further consideration.

The East Side Station with East River Tunnel Alternative met study goals, because it would improve access to East Midtown (by adding a rail station) and relieve congestion at Penn Station (by constructing a new East River tunnel). However, it was found to have several problems rendering it potentially operationally infeasible: (1) all LIRR trains would have had to stop at the new station, adding to running time in some cases and affecting peak hour schedules and throughput to Penn Station; (2) capacity for LIRR reverse peak service through the East River tunnel would be constrained; (3) the plan, which altered track usage and routes for NJ Transit and Amtrak, might not have been acceptable to those carriers; (4) the short distance between the new station and Penn Station would have clearly limited the LIRR's flexibility for re-routing and changing tracks at Penn Station; and (5) connection to local subway service held the potential for pedestrian congestion.

However, because the alternative did meet study goals, had intrinsic merit in significantly expanding tunnel capacity between Queens and Penn Station, and merited a more detailed evaluation because some of the questions related to operational feasibility, this alternative was retained for the next evaluation stage.

SUNNYSIDE TRANSFER STATION ALTERNATIVES

These four alternatives addressed the concept of improving access to East Midtown by facilitating transfers from the LIRR to other carriers on the Long Island side of the East River. Each alternative created a rail station in the vicinity of Sunnyside Yard in Long Island City, close to subways, buses, or new light rail lines, which would bring commuters to East Midtown, as follows:

Queens Plaza Transfer Station (Alternative 7A)

This alternative proposed to bring diesel-hauled LIRR trains operating on the Montauk Branch to a station in Yard A where passengers would connect to the various New York City Transit (NYCT) services at the Queens Plaza and Queensboro Plaza stations.

Harold Interlocking Transfer Station (Alternative 7B)

This alternative proposed to extend the upper level of the 63rd Street tunnel east, past its terminus at Northern Boulevard, through Sunnyside Yard, to Harold Interlocking at 43rd Street. New subway service would be provided by running NYCT BMT Broadway express trains east to the transfer station, where passengers could connect to the LIRR across a platform.

42nd Street LRT Transfer Station (Alternative 7C). This alternative extended the proposed 42nd Street Light Rail Transit (LRT) system north along Third Avenue (for northbound LRT trains) and Second Avenue (for southbound LRT trains), east across the Queensboro Bridge, and into Sunnyside Yard. At a transfer station in Yard A, passengers from LIRR Montauk Branch diesel-hauled trains would connect to the LRT.

Long Island City Intermodal Transfer Station (Alternative 7D). This station plan was developed as part of the MTA Long Island City Transportation Needs and Opportunities Study. It proposed to build a new Sunnyside Transfer Station for LIRR, NYCT, and NJ Transit passengers in the vicinity of Sunnyside Yard and Queens Boulevard. It would have installed platforms on both the LIRR Hunterspoint Line tracks and the Main Line tracks, built an off-street bus terminal, and constructed pedestrian walkways over Sunnyside Yard for access to Queens Plaza and Court Square subway service. Additionally, the alternative would have used the Sunnyside Loop track to provide transfer facilities for NJ Transit passengers working in Long Island City.

Screening Summary

The Queens Plaza Transfer Station Alternative met study goals and would have been operationally feasible, but it was eliminated because it was similar to the Long Island City Intermodal Transfer Station in providing new service. Since it only provided transfer service to Montauk Branch passengers, it was not as beneficial in meeting study goals.

The Harold Interlocking Transfer Station Alternative failed to meet the study's two essential criteria: (1) use of the BMT Broadway express trains would not reduce travel time to East Midtown, because it would bring LIRR passengers only to the northen end of East Midtown, before heading to the West Side; and (2) the diversion of LIRR trains within Harold Interlocking would reduce throughput capacity of trains to Penn Station—thus it would not relieve train traffic congestion. It would have been infeasible operationally as well, since the single-track subway line would not adequately provide the capacity to serve LIRR passengers.

The 42nd Street LRT Transfer Station Alternative met study goals; however, it would have needed an exclusive right-of-way along Second and Third Avenues in Manhattan as well as on the Queensboro Bridge, severely constraining traffic flow in Manhattan and over this key East River vehicular crossing, and was thus operationally infeasible.

The Long Island City Intermodal Transfer Station Alternative met screening level study goals and was found to be operationally feasible, so it was retained past the initial screening stage.

SUBWAY OPERATION OVER LIRR TRACKS

The concept for this set of alternatives was to provide direct service for LIRR customers to Manhattan's East Midtown by running NYCT service on LIRR tracks east of the East River. The alternatives vary widely in location and operation, as follows:

Subway Over Port Washington Branch (Alternative 8A)

This alternative proposed to connect the LIRR Port Washington Branch to the upper level of the 63rd Street tunnel and convert the entire branch to NYCT operation, with trains running along the NYCT Broadway line express tracks.

Subway Over Inner Port Washington and Rockaway Beach Branch (Alternative 8B)

This two-part alternative proposed NYCT subway operation from Great Neck on the Port Washington Branch into Manhattan through the upper level of the 63rd Street tunnel with through service either on the BMT Broadway express, as above, or on the Sixth Avenue line. The Elmhurst and Corona stations were to be reopened. In addition, the inactive Rockaway Beach Branch of the LIRR was to be reactivated and connected to the 63rd Street tunnel. This would have allowed for new NYCT subway service to JFK International Airport. Major capital improvements to the Rockaway Beach Branch were required, including extensive track work.

IRT to the Atlantic Branch (Alternative 8C)

This alternative proposed to convert the LIRR Atlantic Branch (which terminates now at Flatbush Avenue) to NYCT IRT operation and connect the branch to the IRT Seventh Avenue line. This would allow express subway service to operate between Springfield Gardens in Southeast Queens, through the LIRR station in Jamaica, to Downtown Brooklyn and Downtown Manhattan.

Convert LIRR Atlantic Branch to IND Shuttle Train (Alternative 8D)

This alternative proposed to convert the LIRR Atlantic Branch service between Jamaica and Flatbush Avenues to NYCT subway service, and extend the branch east of Jamaica to the Green Acres Shopping Center just over the Nassau County border.

Screening Summary

All four alternatives did not pass the screening. None met the basic study goals of reducing both train traffic congestion at Penn Station and travel time between Long Island and East Midtown. Alternatives 8A, 8B, and 8D would not bring riders to East Midtown, providing service either to West Midtown (with one stop at 63rd Street and Lexington/Third Avenue) or to Lower Manhattan. Alternative 8C would not provide any direct connection to East Midtown. Thus, they all failed to meet a basic study goal. Several serious operational and institutional issues that would be difficult, if not impossible, to overcome were also associated with each alternative.

LIRR OPERATION OVER NYCT TRACKS

This set of six alternatives called for the operation of LIRR trains over tracks currently used by NYCT subways. To negotiate the more restrictive horizontal clearance, curves, and grades found on the NYCT system, each of these options required the use of hybrid, electric multiple unit (EMU) railcars. Additionally, LIRR train lengths would have had to be reduced to conform with NYCT platform lengths.

LIRR Port Washington Branch Connection to NYCT Broadway Line (Alternative 9A)

This alternative proposed to connect the LIRR Port Washington Branch to the upper level of the 63rd Street tunnel and onto the express tracks of the BMT Broadway line, giving commuters a one-seat ride to East 63rd Street at the far northern end of East Midtown and to West Midtown and Downtown Manhattan. As part of this alternative, LIRR trains could continue through Downtown, over the Manhattan Bridge, and onto the Atlantic Branch of the LIRR via a new track connection to the LIRR Flatbush Avenue Terminal in Brooklyn. Regular NYCT subway service would continue to be provided along the Broadway line trains.

LIRR Port Washington Branch Connection to NYCT Sixth Avenue Line (Alternative 9B)

Similar to the above alternative, this alternative would run LIRR Port Washington Branch trains through the upper level of the 63rd Street tunnel to a stop at Lexington Avenue and East 63rd Street, and then along the IND Sixth Avenue line, with an option to continue service through the Rutgers Street tunnel and onto the Atlantic Branch via a new connection to the Flatbush Avenue Terminal.

LIRR Atlantic Branch Connection to NYCT Sixth Avenue Line (Alternative 9C)

This alternative proposed to connect the Atlantic Branch of the LIRR to the Rutgers Street tunnel in Downtown Brooklyn and the IND Sixth Avenue line. This option would have brought LIRR passengers directly into Manhattan and north along Sixth Avenue from West 4th Street to 57th Street and to the Lexington Avenue station at 63rd Street. A new crossover built just north of the 63rd Street station would have permitted trains in this service to reverse direction without conflicting with other trains that were operating along the 63rd Street line.

LIRR Atlantic Branch via Montague Street Tunnel—Clockwise Distribution Loop through Financial District (Alternative 9D)

This alternative offered a one-seat ride into the Financial District in Lower Manhattan. It would have connected the LIRR Atlantic Branch to the Montague Street tunnel (for inbound service into Manhattan) and the Manhattan Bridge (for loop service back to the Flatbush Avenue Station and points beyond), via the Nassau Street subway line.

LIRR Atlantic Branch over BMT Manhattan Bridge—Counter-Clockwise Distribution Loop Through Financial District via Montague Street Tunnel (Alternative 9E)

This alternative proposed similar service to Alternative 9D using the Nassau Street subway line, but in the opposite direction. LIRR trains were to use the Manhattan Bridge for service into Manhattan and either terminate at Chambers Street or Broad Street, or continue through the Montague Street tunnel back to Flatbush Avenue.

Connect LIRR Atlantic Branch to NYCT IND Fulton Street Line at East New York (Alternative 9F)

This alternative connected the LIRR Atlantic Branch to the IND Fulton Street and Eighth Avenue subway line at East New York, allowing for direct service through the Cranberry tunnel into Manhattan. In Manhattan, the LIRR switched to the Sixth Avenue line at West 4th Street for service to Midtown Manhattan.

Screening Summary

Like the other set of subway/LIRR alternatives, this set of alternatives failed to meet the basic study goal of providing improved service to East Midtown and thus did not pass the screening. All would have brought passengers onto West Side subway lines or to Downtown Manhattan. In addition, all posed issues of operational and technical feasibility, and raised institutional issues as well.

CONCLUSION OF LONG LIST ALTERNATIVES SCREENING

As discussed above and shown in Table 20-1, the following alternatives passed the initial screening and were included on the "refined list" of alternatives for further evaluation:

- Bus/HOV Lane Alternative (Alternative 3);
- All East Side Terminal Alternatives (Alternatives 4A-4D);
- East Side Rail Station with New East River Tunnel Alternative (Alternative 6); and
- Long Island City Intermodal Transfer Station Alternative (Alternative 7D).

In addition, the No Action and TSM Alternatives were included in the more detailed evaluation as a basis of comparison.

C. EVALUATING THE REFINED LIST OF ALTERNATIVES

Once the initial screening was complete, the refined list of alternatives was subjected to more detailed evaluation aimed at identifying the most appropriate alternative(s) for consideration in the EIS. This stage of the evaluation established a set of quantitative and qualitative criteria for evaluating the refined list of alternatives. These criteria included issues of performance, cost, community effects, social equity, and environmental impact. The TSM Alternative was included in the evaluation for comparison purposes, and the No Action Alternative served as the baseline against which effects of candidate alternatives were measured.

EVALUATION CRITERIA

These evaluation criteria were developed to represent the full range of considerations that come into play when considering each alternative: what would it cost to build and operate, how would it affect the community and the environment, how useful and effective would it be in solving identified problems, what would its economic impacts be, and would it adversely affect any portion of the population?

Information was developed for the following criteria: order-of-magnitude capital cost range; operating and maintenance costs; revenues, ridership, quality of service, economic impacts, community impacts, environmental impacts, and social equity impacts. Some of the criteria were assessed quantitatively using capital cost estimates. Quantitative assessments also used preliminary ridership forecasts for the year 2020; this gave information for each alternative on the trips it would generate, riders who would use new facilities, travel time savings, and reduction in vehicle miles traveled (VMT). In other categories, where quantification was not available or inapplicable, alternatives were rated according to impacts (from **+++** for the greatest positive impacts, to **– –** for the greatest negative impacts), as shown in Table 20-2.

Table 20-2

Evaluation Criteria

Symbol	O&M Cost Impacts	Impacts on LIRR and NYCT Revenue	Quality of Service		Economic Impacts	Community Impacts	Environmental Impacts	Equity Impacts (Impacts on Access to Transit)
			Travel Time Savings	Comfort and Convenience				
+++				Significant service improvement				Significant improvement
++	Significant decrease (20 percent or more)	Increased revenue for both LIRR and NYCT	15 or more minute reduction	Moderate service enhancement	Long-term positive	Very positive	Long-term positive	Moderate improvement
+	Moderate decrease (less than 20 percent)	Increased for one, no change for the other	0-14 minute reduction	Limited overall service improvement	Short-term positive	Positive	Short-term positive	Limited improvement
0	No change	Increased for one, decreased for the other or no change for both	No change		No change	Negligible or mixed	No change	No change from No Action
–	Moderate increase (less than 20 percent)	Decreased for one, no change for the other	0-14 minute increase		Short-term negative	Negative	Short-term negative	Disproportionate adverse impact
– –	Significant Increase (20 percent or more)	Decreased revenue for both LIRR & NYCT			Long-term negative	Very Negative	Long-term negative	

Note: * The order-of-magnitude capital cost range and ridership impact criteria are not included in the table, as they were rated with numerical values, while the service quality and environmental impacts criteria are included, because they were rated with both qualitative matrix symbols (+/-) and numerical values.

ORDER-OF-MAGNITUDE CAPITAL COST RANGE

How much would each alternative cost to build? This factor was key to the evaluation. Capital cost estimates were developed using a number of factors, including project facilities, support costs (such as design services, construction and project management, etc.), and contingencies. Information about facilities thought to be required for each alternative (including stations and parking, demolition, utilities, track work, structures, maintenance facilities, vehicles, traction power, and signals) was gathered. Support costs were added in as a percentage of construction costs. Finally, allowances for contingencies were added in as a percentage of construction costs (rolling stock at 5 percent of construction costs, track work at 10 percent, and other capital cost elements at 30 percent).

OPERATION AND MAINTENANCE (O & M) COSTS

In addition to how much each alternative would cost to build, another key factor was how much each alternative would cost to operate and maintain. Since actual dollar amounts for each alternative were not available, the alternatives were rated according to broad estimations of how much more or less they would cost to operate and maintain than the No Action Alternative. If a project reduced transportation costs by 20 percent or more, it was given the highest rating (✚✚), if it increased costs by 20 percent or more, it was given the lowest rating (▬ ▬).

REVENUE IMPACT

A complete picture of the total costs of each alternative requires an understanding of new revenue sources generated by the project. By providing new service options and generating new riders and trips, all alternatives, except for the No Action Alternative (which is the base against which they are compared), would increase either NYCT or LIRR revenues, or both. These revenue streams, when offset by capital plus operation and maintenance costs, resulted in a net cash flow estimate for the TSM and Build Alternatives under consideration.

RIDERSHIP IMPACT

Who would use the new service? One measure of a viable alternative is the number of riders and trips it would attract. Using a ridership forecasting model developed for the MIS, ridership potential in the year 2020 was assessed for each alternative and reported as incremental new riders and trips, compared with the 2020 No Action Alternative. Increments ranged from a low of less than 17,000 weekday riders using new facilities (Long Island City Intermodal) to a high of almost 180,000 (East Side Terminal: GCT via the Main Line).

QUALITY OF SERVICE

The quality of service criterion was intended to measure two things: the comfort and convenience of the service, and the time it would save travelers in their daily commutes. Comfort and convenience were assigned only positive ratings (since, as a requirement to pass the initial screening, all alternatives had to improve comfort and convenience). Travel time savings, measured quantitatively, was also rated. Alternatives that saved 15 minutes or more on trips from Long Island to East Midtown Manhattan were given the highest ratings, and those that increased travel time were given the lowest ratings.

ECONOMIC IMPACTS

The effect of each alternative on the local and regional economy was considered. This qualitative evaluation rated each alternative based on how much it would help or hurt the area's economy. It assigned differing weights to impacts, based on their time frame (long- versus short-term) and their scope (regional versus local). For example, greater weight was given to potential long-term lowering of property values due to changing traffic patterns, while less weight was given to the relocation of individual businesses during construction. Similarly, greater weight was given to improving commuting times from Nassau and Suffolk into Manhattan, then to improving access to businesses on one particular block.

COMMUNITY IMPACTS

While financial, ridership and economic considerations are key to gauging an alternative's feasibility and economic viability, they do not give a full picture of an alternative's effects. The alternatives were also evaluated for their community impacts, environmental impacts, and social equity impacts during both construction and operation. Community impacts were assessed using information gathered through the project's public outreach program. The assessment of each alternative emphasized potential impacts during both construction and operation of each alternative.

ENVIRONMENTAL IMPACTS

Each alternative was assessed for its potential environmental effects. In general, these included the potential for property acquisition, relocations and displacement, land use changes, noise and vibration, community disruption, air quality, traffic and pedestrian impacts. Reductions in auto travel, defined as VMTs, were also considered. The impacts were rated for their potential severity and long-term significance.

SOCIAL EQUITY IMPACTS

The equity impact evaluation focused on the extent to which each alternative could affect population groups that are disadvantaged due to low income, race, or inadequate access to public transportation. A primary concern was the extent to which the alternative could improve access to jobs for these disadvantaged groups, and if those improvements outweighed any negative impacts as a result of the alternative. Ratings here included the proximity of the alternative to residential areas where disadvantaged groups lived, the location of potential jobs for these groups in relation to the location of the alternative, and the ease of travel for disadvantaged persons (e.g., transfers en route, reverse commutation, frequency of service).

EVALUATING THE ALTERNATIVES

The decision to retain or eliminate an alternative in the reduced long list was based upon the evaluation results as shown in Table 20-3, and discussed below.

TSM (ALTERNATIVE 2)

The TSM Alternative, as defined in the MIS, was evaluated along with all other alternatives in the refined list. The TSM ratings provide a basis for identifying the degree to which the other Build alternatives offer improvements for their higher costs.

Capital Cost Range

By definition, the TSM Alternative is a lower-cost option than the Build alternatives. All of its components, as outlined in the MIS, were estimated to cost approximately $300 million (1997 dollars).

Impact on Operation and Maintenance Costs

While economic to construct, TSM components required funding for operations and maintenance. Components that would carry with them increased O&M costs included an increase in the number of rail cars in the peak hour on selected LIRR branches, and additional train service to the Long Island City and Hunterspoint Avenue stations. These costs were limited, but still resulted in a rating of moderate increase in O&M costs compared with the No Action Alternative.

Table 20-3

Refined Long List Alternatives Evaluation Summary

Alternative	Impact on O&M Costs	Capital Cost Range (billions of 1997 dollars)	2020 Average Weekday Incremental LIRR Linked Trips (vs. No Action)	2020 Average Weekday Incremental Riders Using New Facility (vs. No Action)	Impact on Travel Time	Travel Time Savings (Person-Hours/Day vs. No Action)	Comfort and Convenience	Revenue Impacts	Community Impacts	Economic Impacts	Environmental Impacts	Automobile Vehicle Miles Traveled (Average Daily Reduction vs. No Action)	Impacts on Social Equity
1. No Action	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2. Transportation System Management	−	0.30	3,680	8,554	+	2,646	+	+	0	+	+	88,333	0
3. Bus/HOV Lane	−	0.3	8,456	11,800	−	4,712	−	−	− −	+	− −	22,584	0
4. LIRR East Side Terminal:													
A. GCT via Main Line	− −	2.8-3.0	23,909	179,257	++	10,801	+++	+	−	++	+	293,473	++
B. GCT via Montauk Branch	− −	3.7-4.4	20,434	167,895	+	5,960	+	+	−	++	−	254,875	++
C. Third Avenue Terminal via Main Line	− −	3.3-3.9	16,893	137,933	++	6,498	++	+	− −	++	− −	209,813	+
D. Third Avenue Terminal via Montauk Branch	− −	4.2-5.0	13,905	131,352	+	2,410	+	+	− −	++	− −	179,475	++
6. New East River Tunnel and East Side Rail Station	− −	2.8-3.0	15,364	174,759	++	12,612	++	+	− −	++	− −	232,524	+
7D. Long Island City Intermodal Transfer Station	−	0.4	2,008	16,662	+	3,914	+	++	+	++	0	33,455	++

Notes:

* Costs are presented in 1997 dollars; NA = not applicable in this analysis. +++ = Substantial benefit. ++ = Moderate benefit. + = Slight benefit. 0 = No change, little impact. − − = Moderate adverse impact potential. − − = High to very high adverse impact potential.

Revenue Impacts

The components of the TSM that resulted in additional LIRR passengers—longer trains on certain branches and additional trains to Long Island City and Hunterspoint Avenue Stations—would increase LIRR revenues. In addition, because the TSM would bring more commuters to Hunterspoint Avenue, transfers to the Flushing line No. 7 train into Manhattan would also increase NYCT revenues. As such, the TSM was rated as improving revenues moderately.

Ridership Impacts

The TSM demonstrates a moderate attraction of new riders (approximately 3,700) and an attendant moderate decrease in automobile VMTs (approximately 88,000 fewer daily vehicle miles). These ridership figures range from approximately 5 percent to 50 percent of the ridership figures for the Build alternatives (discussed below).

Quality of Service

Many of the TSM's components would decrease travel time between Long Island and the Queens side of the East River. Similarly, by improving transfers between the LIRR and subways/ferries into Manhattan, the TSM improved comfort and convenience of travel slightly.

Economic Impacts

Economic impacts are closely related to an alternative's ability to improve the overall transportation network, and therefore improve the efficiency of doing business in the New York Metropolitan Area. For the TSM, moderate travel time savings, new riders, and comfort improvements resulted in moderately positive economic impacts.

Community Impacts

Since all TSM components involve adjusting existing transportation systems, extremely few community impacts were anticipated, as reflected in the neutral rating.

Environmental Impacts

The TSM would reduce daily automobile VMTs on the regional highway network somewhat—an environmental benefit. Construction and operational impacts were minimal. For this reason, it was determined to be of moderate environmental benefit.

Impacts on Social Equity

While the TSM would improve commuter trips into Manhattan, it would have had little positive impact on the extent to which disadvantaged residents could access transit, and was so rated.

Summary of Evaluation

The TSM Alternative did not meet project needs and goals as well as the Build alternatives. However, it is retained for comparison purposes in the DEIS, updated to reflect recently completed railroad improvements and the latest future planning assumptions.

EXPRESS BUS/HOV (ALTERNATIVE 3)

Capital Cost Range

The Express Bus/HOV Alternative had costs similar to the TSM, approximately $300 million. It too, was a low-cost improvement to the transportation system.

Impact on O&M Costs

Moderate costs to operate new express bus service into Manhattan are reflected in its "slight increase in costs" rating.

Revenue Impacts

While express bus service would have generated revenue in the form of fares from new passengers, new riders would be drawn off of both LIRR trains and NYCT subways. Since both LIRR and NYCT revenues would therefore decrease marginally, this alternative received a (▬) negative rating.

Ridership Impacts

This alternative generated the fewest number of new transit riders among all alternatives other than the TSM, because the majority of its passengers would be drawn from a relatively narrow market corridor centered on the LIE. As such, it would not permit the LIRR to reduce peak hour trains to Penn Station and thereby would not relieve congestion there.

Quality of Service

While travel time data generated by preliminary ridership forecasts indicate potentially significant savings, these savings would vary widely, depending on conditions on the LIE, in Manhattan, and over the Queensboro Bridge in PM peak periods. Data indicate that eastbound trip times would be approximately 25 minutes longer than westbound trip times, nullifying much of the travel time savings gained in the inbound commute from Nassau and Suffolk. Given small overall travel time savings and a generally comfortable, one-seat ride in motor coaches, quality of service was rated as slightly beneficial as compared with the No Action Alternative.

Economic Impacts

The new express bus service may facilitate some short-term retail and/or residential economic development around park-and-ride lots on Long Island. It would not, however, have large-scale positive impacts on economic development in the region.

Community Impacts

The increased traffic and noise due to additional express buses on local streets in Manhattan were considered adverse community impacts, as was the increased congestion at existing express bus loading and unloading stops in Manhattan. The extent of concerns raised about these issues resulted in the Express Bus/HOV Alternative receiving a rating of highly adverse community impact.

Environmental Impacts

While the Express Bus/HOV Alternative would have resulted in a modest decrease in daily automobile VMTs of approximately 23,000, this slight environmental benefit would be more than offset by the alternative's adverse impacts, including increased traffic congestion (and related pollutant emissions) on other LIE lanes due to the taking of highway space to build HOV lanes in Manhattan, on the Queensboro Bridge, and on Queens Boulevard.

Impacts on Social Equity

This alternative would primarily serve those workers who live on Long Island, commute into Midtown Manhattan, and have access to cars with which they can drive to park-and-ride lots.

The alternative would not provide reverse-peak service to allow city residents to access jobs on Long Island. As such, the alternative would have been of little benefit to disadvantaged residents.

Summary of Evaluation

The Express Bus/HOV Alternative did not meet one of the project's essential screening criteria, in that it did not draw enough riders away from the LIRR to relieve train traffic congestion in Penn Station. This alternative was also suspected of being operationally infeasible as well, because of its potential impacts on vehicular traffic congestion in Manhattan. It was included for further evaluation, however, because it was a non-rail build alternative, one that attempted to use a companion mass transit travel system to meet project objectives. The more detailed evaluation did not enhance this alternative, but instead revealed a number of additional problems. Although it showed certain very moderate economic, travel time savings, and ridership benefits, the alternative also evinced a number of adverse effects, including:

- Community impacts, including a conflict with New York City policy to discourage additional express buses on Midtown streets, since they would exacerbate very congested conditions already occurring there, and a related impact on neighborhoods along the travel routes that are already burdened by very heavy traffic.
- Environmental impacts, primarily noise and air pollution associated with bus travel and increased traffic congestion in Midtown Manhattan.
- Social equity, in that this alternative favored the Long Island resident with access to a car, but provided no reverse commute or other improvement to public transportation for lower-income and other disadvantaged workers and residents.

The alternative was therefore eliminated from further consideration. However, portions of this alternative (e.g., extending the existing exclusive bus and taxi lane) are now included in the TSM Alternative presented in this DEIS.

EAST SIDE TERMINAL (ALTERNATIVES 4A-4D)

These four alternatives, all of which proposed to bring riders to a new LIRR terminal on the East Side, were each found to have high construction costs, but to offer a combination of good ridership demand and travel time savings, along with fiscal benefits, such as positive revenue impacts and economic effects. The level of benefit varied, however, among the alternatives, as did the potential for adverse effects in other areas, as discussed below.

Capital Cost Range

Capital costs for the four alternatives ranged from a low of $2.8 billion to a high of $4.4 billion (in 1997 dollars). Major cost items for each of the four alternatives included procurement of electric rolling stock, construction of new tunnels in Manhattan and Queens, and construction of new LIRR facilities. Alternatives that included connections from the Montauk Branch in Queens (4B and 4D) had the highest capital costs, due to significant added costs of upgrading signal systems, building an elevated structure, and electrifying the Montauk Branch west of Jamaica to its connection to the 63rd Street tunnel. Costs of alternatives that would build a new LIRR terminal under Third Avenue (4C and 4D) were also slightly higher than those that would utilize GCT, due to the more extensive construction needed. Appropriately, Third Avenue via the Montauk Branch carried the highest capital costs, as it included both the Montauk connection and the Third Avenue Terminal.

Impact on O&M Costs

All East Side Terminal alternatives were determined to have high adverse impacts on O&M costs. This is not surprising, as they all required the construction of new infrastructure and fleet expansion, which would require major increases in operations and maintenance activities.

Revenue Impacts

Each of the four alternatives had similar revenue impacts: increased LIRR revenue due to additional riders attracted to the new service, and marginal decreases in NYCT revenues due to the relatively small number of riders who would switch from subways to the LIRR.

Ridership Impacts

Of the four alternatives, GCT via the Main Line showed the strongest ridership projections in every category: approximately 24,000 new trips, 180,000 total riders, and a reduction in daily automobile VMT of over 290,000. With few exceptions, GCT via Montauk ranked second in all ridership categories, Third Avenue Terminal via the Main Line third, and Third Avenue via Montauk ranked fourth. One factor that contributed to the strong performance of GCT via the Main Line was the speed with which trains could get from the Main Line to East Midtown (reducing travel times, attracting new and current riders, and subsequently reducing daily VMTs) as compared with using the Montauk Branch to access East Midtown. Another factor was the proximity to the subway and to place of work provided by a terminal at GCT (also reducing travel times, attracting new and current riders, and subsequently reducing daily VMTs). These two factors accounted for much of this alternative's superiority to the ridership evaluation.

Quality of Service

As mentioned above, alternatives that save travel time tend to be more popular with commuters, generating higher ridership numbers. Appropriately, GCT via the Main Line saved the most person-hours each day (almost 11,000) compared with the other three alternatives (from 2,400 to 6,500 person-hours). As such, it was ranked highest in "Impact on Travel Time," along with the Third Avenue Terminal via the Main Line, which would also have saved more than 15 minutes on a one-way commute.

In terms of comfort and convenience, GCT via the Main Line again ranked highest, for two reasons. First, it would provide a direct link to East Midtown for all LIRR customers, including those at stations along the Main Line west of Jamaica, whereas the Montauk Branch alternatives would have required passengers west of Jamaica to transfer to Port Washington Branch trains at Woodside to access the new service. Second, it would provide direct access to subway service from GCT in Manhattan, whereas Third Avenue Terminal alternatives would have required passengers to travel farther to transfer to the subway.

Economic Impacts

Because of their overall ability to meet all study goals, each of the four alternatives would have significantly improved the region's transportation system. In addition to generating short-term construction jobs, all four alternatives could have been expected to spur long-term economic activity, and were rated highly in this measure.

Community Impacts

Community concerns for all four alternatives centered around the disruption associated with constructing a large-scale transportation project—noise and vibration, street closings, and truck traffic. However, the two Third Avenue Terminal alternatives would have engendered more intensive community concerns due to the added disruption of constructing an entirely new terminal under a major thoroughfare. As such, the GCT options were given moderate adverse impact ratings while the Third Avenue Terminal alternatives were given highly adverse impact ratings.

Environmental Impacts

GCT via the Main Line was the only alternative of the four rated that compared favorably in terms of environmental benefits. All four alternatives would have had negative traffic and pedestrian effects in the area of the new terminal, potential increases in noise levels due to additional trains running along LIRR lines (especially the Montauk Branch, which is not currently heavily used), and temporary environmental impacts due to construction. However, it was determined that the substantial offsetting positive regional environmental impacts of GCT via the Main Line (i.e., reductions in VMTs and associated pollutants) were sufficient to give it a positive rating. While the other alternatives would have also had somewhat offsetting positive impacts, it was determined that these impacts would not have been sufficient to warrant a positive rating.

Impacts on Social Equity

Each alternative would enable disadvantaged residents in Manhattan (in neighborhoods along the Lexington Avenue subway line in East Harlem and the Lower East Side) to access jobs on Long Island, and also residents on Long Island to access jobs in the Sunnyside area of Queens. As such, all alternatives were rated as offering moderate benefits.

SUMMARY OF EVALUATION

The net rating for the GCT via the Main Line Alternative (4A) was clearly positive. It had the highest ridership of the four, reflecting significant travel time savings to East Midtown. These plus factors gave rise to another important positive impact: long-term economic activity. The costs, while relatively high, were at least half a billion dollars less than in the three other East Side Terminal options. The alternative's potential negative community and environmental effects were generally limited to the construction phase. As with the other three alternatives, social equity effects were moderately beneficial.

The GCT via the Montauk Branch (4B) merited more mixed ratings, lower than those of GCT via the Main Line. Costs were predicted to be considerably ($1.1 billion) higher, and ridership was lower. The smaller diversion of auto users to the train reduced the air quality benefit of this alternative, so that its overall rating on environmental concerns was slightly negative, compared to the GCT via the Main Line's overall beneficial rating.

Both of the Third Avenue Terminal alternatives (4C and 4D) also did not show the benefits of the GCT via the Main Line alternative. They cost more (especially the Third Avenue Terminal via the Montauk Branch [4D]) and their ridership was lower. With lower ridership, they did not merit a positive overall environmental rating. These alternatives were also distinguished from the GCT options by the more serious community and related noise impacts during construction of the terminal beneath Third Avenue.

In short, GCT via the Main Line (4A) was found to be clearly superior to its three similar options, and the three were therefore dropped from further consideration.

EAST RIVER TUNNEL WITH EAST SIDE RAIL STATION (ALTERNATIVE 6)

Capital Cost Range

Costs for this alternative, while not quite as high as for the East Side Terminal alternatives, would have approached $3 billion. This reflects the capital cost of constructing an entirely new tunnel under the East River, continuing it under 31st Street more than halfway across Manhattan into Penn Station, constructing new facilities in the southern half of Penn Station, and constructing an underground station in East Midtown.

Impact on O&M Costs

As for the East Side Terminal alternatives, O&M costs were expected to rise by at least 20 percent. Costs included maintaining an additional right-of-way and operating and maintaining a new station in East Midtown.

Revenue Impacts

Like the East Side Terminal alternatives, an east side station would draw substantial additional new transit riders to the LIRR and reduce subway ridership only slightly, resulting in a positive impact on LIRR revenues and no impact on NYCT revenues.

Ridership Impacts

This alternative would have generated more total riders that any other alternatives (approximately 180,000 per day) and a significant number of new transit riders (almost 24,000). Accordingly, it would have reduced daily VMT by more than 290,000.

Quality of Service

Creating a new east side rail station would save more travel time than any other alternative and retained a one-seat ride into East Midtown for many LIRR riders. While subway connections from the east side station would be limited to local service, congestion at the 33rd Street/Lexington Avenue station would be serious, and fewer employees would be within walking distance of offices closer to GCT, the convenience of this new station outweighed these factors and the alternative was highly rated in regard to quality of service to East Midtown. However, it would actually degrade service to Penn Station by requiring that all trains stop at the new station, thus increasing travel time for all trains to that terminal and reducing hourly capacity. Thus, it failed to meet a basic project objective.

Economic Impacts

Similar to the East Side Terminal alternatives, the East Side Station with East River Tunnel Alternative would significantly improve the transportation system in the New York Metropolitan Area. It would ease passenger congestion at Penn Station and through the East River tunnels and provide convenient access to East Midtown. These extensive transportation benefits could be expected to generate long-term benefits to economic development, especially in the vicinity of the new East Side Station.

Community Impacts

This alternative was expected to generate severe impacts on local communities, mostly due to construction requirements. Large areas of cut-and-cover construction would be required between Fifth and Seventh Avenues, as well as demolition and displacement of residential and commercial properties along the proposed route. In addition, constructing a new rail station adjacent to and above the existing East River tunnel approaches to Penn Station, while maintaining full service to Penn Station, would require elaborate construction staging, including the closure of streets and sidewalks for extended periods of time.

Environmental Impacts

Environmental impacts of this alternative were found to be predominantly negative. It would have substantial impacts during construction, including waterfront effects, impacts on the East River, noise and vibration from substantial tunneling including cut-and-cover methods, and community disruption from cut-and-cover construction between Madison and Third Avenues along 32nd or 33rd Streets. Long-term impacts during operation include potential effects on the 33rd Street subway station on the No. 6 line, which is a designated New York City Landmark (NYCL), and additional traffic and pedestrian congestion in the vicinity of that station.

Impacts on Social Equity

While this alternative would not create a new station in Long Island City, it would improve reverse commuting from the East Side of Manhattan to Long Island, improving the capacity of disadvantaged residents on the East Side of Manhattan to get to jobs.

Summary of Evaluation

The East River Tunnel with East Side Train Station Alternative did not meet one of the project's essential screening criteria, in that it would not be operationally feasible if the study objective to relieve train traffic congestion at Penn Station was to be met. It was included for further evaluation, however, to better understand its operational possibilities and its benefits. The more detailed evaluation did not enhance this alternative, but confirmed the screening conclusions. Level of service at Penn Station would actually decrease, because the operating plan found that all trains would have to stop at the new station. This would add to travel times and limit the number of trains per hour that could approach Penn Station. The cost of the alternative was equivalent to that of the GCT via the Main Line Alternative and not as high as some of the East Side Terminal alternatives, but its overall benefits were lower. The alternative involved serious community disruption during construction of the station beneath the street and provided a connection only to a local subway station, which is an NYCL station of limited capacity. Because it did not meet basic criteria and the additional evaluation only revealed additional problems, this option was dropped from further consideration.

LONG ISLAND CITY INTERMODAL TRANSFER STATION (ALTERNATIVE 7D)

Capital Cost Range

Capital costs of approximately $400 million would be required for construction of the subway extension from the upper level of the 63rd Street tunnel, the new intermodal subway/LIRR terminal, and a new bus terminal above the railroad facilities.

Impact on O&M Costs

O&M costs were expected to be minor in this alternative. They would encompass operating and maintaining the new intermodal station and the modest subway extension.

Revenue Impacts

Both LIRR and NYCT revenues were projected to increase as a result of this alternative. A limited number of additional LIRR passengers would use the intermodal terminal to transfer to the subway. However, the fact that revenues for both carriers would only have increased slightly over the No Action Alternative (due to the relatively few additional riders) led to a downgrading of the rating from ✚✚ to ✚.

Ridership Impacts

The intermodal terminal was determined to generate the fewest new riders of any alternative other than the No Action Alternative (fewer than even the TSM). Additionally, fewer than 17,000 people in total would use the new facility on a daily basis—approximately one-tenth the number of riders using other new terminal or station alternatives.

Quality of Service

Since the subway connection envisioned in this alternative would have required passengers to transfer in Manhattan at Lexington Avenue and 63rd Street to the Lexington Avenue local train to reach many East Midtown destinations, its ability to reduce travel times was minimal. Only the TSM reduced travel times to a lesser extent than this alternative, which would improve service over the No Action level; however, those improvements would be minimal.

Economic Impacts

Most of the positive economic impacts of this alternative were related to its potential for spurring development in the Sunnyside/Long Island City area of Queens, an area envisioned by planners as a possible fourth Central Business District of New York City.

Community Impacts

Very few community impacts would be expected under this alternative. No construction in Manhattan and unobtrusive construction in a rail yard in Queens would impact few local residents. Accordingly, this was the only alternative that was rated as positive in regard to community impacts.

Environmental Impacts

Overall environmental impacts would be neutral, since the alternative would create impacts during construction, but would also generate a minor reduction in VMT and traffic congestion.

Impacts on Equity

This alternative performed well in providing access to jobs in the Long Island City area for disadvantaged residents of New York City and Long Island. In addition to providing rail access to the area, convenient bus transfers would support those who do not own cars. This alternative would not, however, improve access to jobs in Nassau and Suffolk Counties.

Summary of Evaluation

In summarizing the evaluation of the Intermodal Transfer Station Alternative, the most significant measure was the very limited number of new LIRR riders projected to use the station, a major deficiency. Even though the option achieved some positive ratings, its failure to improve quality of service and reduce travel time between Long Island and East Midtown was found to be an overriding limitation. The alternative was thus dropped from further consideration.

However, the idea of a station in the vicinity of the Sunnyside Yard enhanced the City's plans for economic growth in Long Island City and was very well received within the community. In support of development in this area of Queens, LIRR agreed to include a rail station at Sunnyside near Queens Boulevard as part of the Preferred Alternative.

CONCLUSIONS OF THE REFINED LIST ALTERNATIVES EVALUATION

The evaluation of the refined list of alternatives resulted in the selection of GCT via the Main Line Alternative 4A as the Preferred Alternative. Each of the other alternatives was judged to be inferior to GCT via the Main Line for the following reasons, as detailed above:

- The primary reason for eliminating the Express Bus/HOV Alternative (3) was that it would not have drawn enough riders to alleviate congestion at Penn Station. Secondarily, it would have adverse impacts on local communities, the environment, and social equity.
- The three other East Side Terminal Alternatives (4B, 4C, and 4D) would all have cost considerably more than GCT via the Main Line, while drawing significantly fewer riders. Accordingly, 4B, 4C, and 4D would reduce automobile VMT by less than GCT via the Main Line and would be less beneficial to the environment.
- The East River Tunnel with East Side Train Station Alternative (6) was fatally flawed in that it would not have relieved train traffic at Penn Station. Further analysis showed that it actually would have negative effects on train traffic at Penn Station and would have disrupted the community significantly during construction.
- Similar to the Express Bus/HOV alternative, the Intermodal Transfer Station Alternative (8D) would not draw enough riders to warrant its selection. Furthermore, it would not improve quality of service or reduce travel times significantly.

D. EVALUATION OF OTHER ALTERNATIVES

APPLE CORRIDOR

In June of 1996, The Committee for Better Transit published Apple Corridor, a proposal for a one-seat rail link between GCT and John F. Kennedy International Airport (JFK). The link would route trains from GCT, through new and existing tunnels to LIRR tracks at Harold Interlocking adjacent to Sunnyside Yard, to Rego Park along current LIRR tracks, and on to JFK along a Rockaway Beach LIRR branch restored to service and newly constructed tracks. Key to the Apple Corridor proposal was a LIRR connection to GCT similar to MIS Alternative 4A: GCT via Main Line, which was identified as the Preferred Alternative (as described above). The Apple Corridor proposal, however, called for a slightly different means of access to GCT than did Alternative 4A.

A number of components of the Apple Corridor proposal led to the decision to retain the core components of GCT via Main Line, rather than those of Apple Corridor, for the ESA Project:

USE OF UPPER-LEVEL METRO-NORTH TRACKS

Apple Corridor called for the use of the five westernmost tracks (38-42) of the upper level of GCT for both LIRR service and airport access service. This would have had a number of adverse impacts on Metro-North, would not have been sufficient to handle projected LIRR passenger volumes, and would have been more costly to construct than originally envisioned:

The use of these five upper level tracks would have provided LIRR and Airport Access service at the expense of existing and future Metro-North service. On the contrary, GCT via Main Line would use existing, predominantly non-revenue trackage in the lower level to preserve Metro-North's current operations and maintain space for future Metro-North growth. While GCT via Main Line would use four Metro-North passenger tracks from the lower-level, it would not use upper level tracks, which are currently heavily used by Metro North and accommodate 12-car trainsets. In addition, use of the five westernmost upper level tracks would have completely taken away Metro-North's access to the upper level loop track—severely constraining Metro-North operations.

CREATING CAPACITY FOR LIRR AND AIRPORT ACCESS

The Apple Corridor proposal would not have created sufficient capacity to handle LIRR peak hour service. Track and platform alignments would have accommodated only 18 trains/hour (versus GCT via Main Line's 24 trains/hour), and would have utilized existing platforms of insufficient width to accommodate large LIRR commuter crowds. Moreover, Apple Corridor's proposed simplified track configuration on approach to GCT would not have permitted parallel train moves: just a single track in and a single track out—insufficient to handle LIRR and Airport Access service concurrently. The same shortcomings were apparent in the vicinity of Sunnyside Yard in Queens, where the Apple Corridor proposal did not address the need for midday storage of LIRR trains. Finally, Apple Corridor would require all LIRR passengers heading to or from GCT to transfer at Jamaica.

COST ESTIMATES

Apple Corridor's cost estimate, which was significantly lower than that of GCT via Main Line, did not include key elements that would have brought its costs into line with those of GCT via Main Line, including throughput connections at Harold Interlocking; mitigation for loss of Metro-North tracks, platforms and upper loop; design and construction of additional exits and cross passageways at GCT; real estate/easement costs; mitigation of Lexington Avenue subway impacts; and midday train storage, among others.

For the above reasons, Alternative 4A: GCT via Main Line, was retained as the Preferred Alternative for East Side Access.

E. SELECTION OF A LOCALLY PREFERRED ALTERNATIVE

On June 25, 1998, a NYMTC resolution affirmed that the Long Island Transportation Corridor MIS study was completed and the GCT via the Main Line Alternative was the Locally Preferred Alternative. The GCT via the Main Line Alternative is called the Preferred Alternative, and together with the No Action and TSM Alternatives, is evaluated further in this DEIS. ❖

Chapter 21: Irreversible and Irretrievable Commitment of Resources

The irreversible and irretrievable commitment of resources required for either the TSM or Preferred Alternative being considered by the East Side Access Project include construction materials, energy, labor, funds, and land. Construction materials, energy supplies, and labor used to construct any of the alternatives are generally not retrievable. They are not in short supply, however, and their use would not have an adverse impact on their continued availability for other projects. Also, labor expenditures are consistent with governmental incentives to spur growth.

The total commitment of funds required for construction, including easements, is described in Chapter 2, and varies between $656 million and $4.71 billion, depending on the alternative.

The TSM Alternative would require a relatively small commitment of land. While the Preferred Alternative would require a greater commitment of land, much of it is currently rail or railyard right-of-way. Easements beneath or through private property would be acquired under the Preferred Alternative.

These resources would be committed to benefit residents of the immediate area, state, and region by an improved transportation system. Benefits would include improved accessibility, savings in travel time, reductions in crowding and delays, reductions in travel by automobile and taxi, and greater availability of quality services, which would together outweigh the commitment of these resources. There are no other known resources that would be committed as a result of the construction of any of the alternatives.

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Chapter 22: Relationship Between Local Short-Term Uses of the Environment and the Maintenance and Enhancement of Long-Term Productivity

A. INTRODUCTION

Short-term effects on the environment result from construction impacts. Long-term effects relate to the maintenance and enhancement of long-term productivity—in particular, the consistency of the project with long-term regional and local planning objectives. The short- and long-term effects of each alternative are summarized below.

B. SHORT-TERM USES

The No Action Alternative would not require major construction and thus would not result in any short-term impacts, either adverse or beneficial.

The TSM Alternative would have minor short-term effects related to its construction. These would primarily be inconveniences associated with traffic delays and noise while the roadway reconstruction portion of the TSM Alternative is underway. At the same time, this alternative would create jobs as well as related economic benefits during construction.

The Preferred Alternative would have more substantial impacts during construction (see the discussion in Chapter 17, "Construction and Construction Impacts") than the other two alternatives. As discussed in Chapter 17, the impacts of the Preferred Alternative would be predominantly associated with the noise and vibration, dust, traffic and pedestrian congestion, and their related effects on neighborhood character as a result of new construction, particularly near cut-and-cover portions of the work or near the access shaft site in Queens. The short-term construction impacts of Option 2 would be much less than those of Option 1 in Manhattan. Construction of both options would have some potential to result in adverse impacts on nearby ground-floor retail uses. As a mitigating component of short-term uses of the environment, the Preferred Alternative would create significant economic benefits during construction, in the form of jobs and the direct and indirect demand for goods and services.

C. LONG-TERM PRODUCTIVITY

As described in Chapter 1, "Purpose and Need for the Project," planning for transportation improvements in the Long Island Transportation Corridor began in the 1960's, with plans for the construction of the 63rd Street Tunnel. The ESA Project is one of several being undertaken as part of the MTA's Long Range Planning Framework, developed to identify and implement a unified program of improvements that would connect jobs to commuter rail, alleviate overcrowding, reduce travel time, better connect the rail and subway lines, provide high-quality transportation service, and extend service to underserved areas. The ESA Project has been conducted in coordination with the other studies included in the Long Range Planning Framework, as well as other local and regional plans, including the Long Range Plan and Transportation Improvement Program for the New York Metropolitan Region, sponsored by the New York

Metropolitan Transportation Council; the New York State Air Quality Implementation Program; and other transportation plans and studies now under way.

Long-term benefits to productivity addressed by the project's Preferred Alternative would include the following:

- Improved regional and local accessibility.
- Reduced travel time.
- Reduced congestion and overcrowding on the LIRR and at Penn Station.
- Improved reliability of commuter rail.
- Accommodation for projected future ridership.
- Support for the region's economic development.
- Reduced automobile traffic in the region.
- Significant reductions in mobile source air pollutants.
- An overall reduction in subway crowding.

D. CONCLUSION

Local short-term impacts in use of resources resulting from the Preferred Alternative would be consistent with the maintenance and enhancement of long-term productivity for the local area, state, and region.

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A. INTRODUCTION

The development of any mass transportation improvement using federal aid must comply with project development procedures and other policy guidance established by federal legislation and Federal Transit Administration (FTA) implementing regulations. This chapter describes the federal requirements and presents a summary of the planning and decision-making that has been performed date on the East Side Access Project. In addition, the extensive public outreach program that was initiated during the Major Investment Study (MIS) for the Long Island Transportation Corridor, and expanded on during the preparation of the Draft Environmental Impact Statement (DEIS), is described.

The East Side Access Project has the potential to affect a diverse set of stakeholders, including LIRR commuters who live on Long Island and work in Manhattan, residents and employees who live and work near the project route in Manhattan and Queens, commuters in Connecticut and the northern suburbs of New York who take Metro-North Railroad to Grand Central Terminal (GCT), and Amtrak and New Jersey Transit (NJ Transit)passengers who travel into and out of Penn Station. As such, the public participation initiative for this project includes a variety of outreach tools, combining formal elements such as public meetings, community board presentations, and advisory committee meetings with informal components like fact sheets, seat drops, and one-on-one meetings. Meetings continue to be held throughout the study area in New York City (Manhattan, Brooklyn, and Queens), Nassau and Suffolk Counties, and the Metro-North service area in the northern suburbs of New York and Connecticut.

B. PROCESS AND DECISION-MAKING TO DATE

This DEIS is prepared in accordance with the regulations of the National Environmental Policy Act of 1969 (NEPA). NEPA requires federal agencies to evaluate the environmental consequences of proposed actions and their alternatives, to identify measures to mitigate any significant adverse impacts, and to conduct the entire process in coordination with other agencies and the public. In compliance with the requirements of NEPA, the FTA cannot approve or fund the East Side Access Project's construction until the environmental review process is complete.

The analysis of the East Side Access Project's environmental effects began in 1995, concurrent with the preparation of the MIS. The Notice of Intent was published and the public scoping process was performed. Three public scoping meetings were held in July 1995 to satisfy NEPA requirements for the MIS/DEIS process. The MIS was conducted pursuant to the transportation planning procedures established under the Intermodal Surface Transportation Efficiency Act of 1991 (ISTEA). That statute required the preparation of an MIS in connection with an application for federal funding of capital projects for mass transportation systems. The MIS was prepared to evaluate the effectiveness of a wide range of alternative investments or strategies to attain the transportation goals for the Long Island Transportation Corridor that are presented in Chapter 1, "Project Purpose and Need." The alternative development and evaluation process and results are summarized in Chapter 20, "Alternative Screening and Evaluation."

As a result of the MIS process, the New York Metropolitan Transportation Council (NYMTC) selected a locally preferred alternative on June 25, 1998 (Resolution No. 94A). Conceptual engineering was then undertaken for the locally preferred alternative, i.e., the Preferred Alternative evaluated in this DEIS that would provide LIRR service through Sunnyside to GCT via the lower level of the 63rd Street Tunnel. As part of the engineering effort, engineering options were developed for the Preferred Alternative and are evaluated in this document. In accordance with NEPA, this DEIS also evaluates the environmental consequences of the No Action Alternative and a Transportation Systems Management (TSM) Alternative. The project has included an extensive public outreach program, initiated during the MIS phase and continuing throughout the DEIS phase.

Public review of the DEIS began with publication of this document. A Notice of Availability of the DEIS has been published in the Federal Register. Public hearings on the DEIS will then be held to provide an opportunity for public comment. The hearing record will remain open for receipt of public comment until 45 days after the publication of the Notice of Availability.

An Final EIS (FEIS) for the proposed action will be prepared after receipt and evaluation of comments on the DEIS. The FEIS will identify the comments received and provide responses. A Record of Decision (ROD) will be prepared by FTA after its review of the FEIS, stating their determination on project funding and implementation. Consistent with NEPA requirements, the ROD will be prepared no earlier than 30 days after publication of a Notice of Availability of the FEIS in the Federal Register.

C. PUBLIC PARTICIPATION PROGRAM ELEMENTS

This public participation effort is being performed in compliance with the guidelines of ISTEA, the Transportation Equity Act for the 21st Century (TEA-21), the National Environmental Policy Act of 1969 (NEPA), Executive Order 12898 ("Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations"), and other public outreach guidelines, including those of the NYMTC. In accordance with federal guidelines, this public outreach program included early, proactive, ongoing, and customized outreach and participation.

The primary goal of the public outreach program is to create a public forum for the exchange and discussion of information among the project team, concerned citizens, and federal, state, and local agencies. The program has encouraged dialogue between all interested parties, beginning early in the planning process and continuing throughout the EIS process. In addition to meeting NEPA requirements, the public outreach program is intended to set the stage for continued and extensive public and agency involvement as the project moves into later phases of design and construction.

A Comprehensive Communications and Coordination Plan (CCCP) was developed to guide the project's public participation program. The components of the plan include presentations and meetings for interested parties, presentations and question and answer sessions at community board meetings in New York City, general information meetings for the public, presentations and meetings with transit organizations, technical and citizens advisory committee meetings, meetings with relevant regulatory and environmental agencies, public hearings on the DEIS, and printed materials (fact sheets, brochures, etc.).

PRESENTATIONS AND MEETINGS

Throughout the environmental review process, meetings have been held with various interested parties to solicit input on the project. Participants have represented a variety of groups, including elected officials; residents; civic, business, labor, transportation, environmental, and neighborhood organizations; and other interested parties throughout the New York region.

COMMUNITY BOARD COORDINATION

The New York City community boards in the project area have provided the project team with valuable input on key environmental concerns. Presentations have been held with the transportation committees and full boards to review both the environmental studies conducted and the conceptual design for the project, and to generate support for the project. Table 23-1 lists the community board presentations made from completion of the MIS through the end of the DEIS process. Presentations will continue through the duration of the project.

Table 23-1
Community Board Presentations

Date	Organization	Discussion Topic
4/7/99	Queens Community Board No. 2, Full Board	Project overview and status Upcoming activities
4/12/99	Queens Community Board No. 7, Public Hearing	Project overview and status Upcoming activities
4/27/99	Brooklyn Community Board No. 8, Transportation Committee	Project overview and status Upcoming activities
5/3/99	Queens Community Board No. 11, Full Board	Project overview and status Upcoming activities
5/4/99	Queens Community Board No. 4, Full Board	Project overview and status Upcoming activities
5/13/99	Manhattan Community Board No. 5, Full Board	Project overview and status Upcoming activities
6/2/99	Manhattan Community Board No. 5, Transportation Committee	Project overview and status Upcoming activities
7/21/99	Manhattan Community Board No. 8, Full Board	Project overview and status Upcoming activities Grand Central Terminal Option
9/13/99	Manhattan Community Board No. 6, Transportation Committee	Project overview and status Upcoming activities
9/14/99	Manhattan Community Board No. 4, Transportation Committee	Project overview and status Upcoming activities
10/13/99	Manhattan Community Board No. 6, Full Board	Project status Service to be provided
11/1/99	Manhattan Community Board No. 6, Transportation Committee	Project status Upcoming activities, ridership forecasts

Note: Does not include 10 community board presentations held during the MIS phase.
Source: AKRF, Inc.

PUBLIC INFORMATION MEETINGS

Public information meetings are held at project milestones, to update the public on project progress. In advance of meetings, notices are sent to all persons and agencies on the project mailing lists, advertisements are placed in local and regional newspapers, posters are placed in Metro-North Railroad and LIRR stations, and seat drops are made in trains.

To date, two sets of meetings have been held in Manhattan, Queens, and Nassau and Suffolk Counties. One set of meetings was held in Westchester County and Connecticut. Table 23-2 lists the public information meetings. These meetings will continue throughout the EIS process.

Table 23-2

Public Information Meetings

Date	Location	Discussion Topic
5/18/99	Manhattan	Project status, environmental studies
5/19/99	Queens	Project status, environmental studies
5/25/99	Nassau County	Project status, environmental studies
6/7/99	Connecticut	Project status, environmental studies
6/8/99	Suffolk County	Project status, environmental studies
6/14/99	Westchester County	Project status, environmental studies
11/3/99	Manhattan	Tunnel alignments, GCT entrances
11/9/99	Nassau County	Tunnel alignments, GCT entrances
11/10/99	Suffolk County	Tunnel alignments, GCT entrances
11/17/99	Queens	Tunnel alignments, GCT entrances

Note: Does not include seven public information meetings held during the MIS phase.
Source: AKRF, Inc.

SMALL GROUP MEETINGS AND PRESENTATIONS

The public outreach effort has built in opportunities to provide information and respond to concerns or comments expressed by local and regional organizations, through individually tailored, small group presentations. These presentations will continue throughout the EIS process and into final design and construction. Table 23-3 lists the presentations made through November 1999.

Table 23-3

Small Group Meetings and Presentations

Date	Organization	Discussion Topic
2/4/99	Metropolitan Railroad Club	Project overview and status
2/9/99	American Society of Civil Engineers	Project overview and status
3/2/99	Permanent Citizens Advisory Committee to the MTA	Project overview and status
4/22/99	Society of Professional Engineers	Project overview and status
5/13/99	Women's Transportation Seminar, Greater NY Chapter	Project overview and status
5/26/99	ASCE Panel Discussion on Tunneling	Tunneling
10/5/99	New York University, Wagner Graduate School of Public Policy	Project overview and status

Note: Does not include approximately 35 small group meetings, presentations, or tours held during the MIS phase.
Source: AKRF, Inc.

TECHNICAL ADVISORY COMMITTEE (TAC)

The Technical Advisory Committee includes representatives of federal, state, and local transportation, environmental, and planning agencies; municipal officials; and the local metropolitan planning organization. TAC members serve as the technical review group for the environmental studies as well as liaisons to their respective organizations, sharing updates and pertinent information. Meetings have been held on a continuing basis throughout the project. Many TAC members have also participated in other meetings, such as the regulatory agency group (discussed below), or met individually with the project team to discuss specific technical issues. Table 23-4 lists the TAC meetings held through the end of November 1999. Additional meetings will be held through the duration of the project.

Table 23-4

Technical Advisory Committee Meetings

Date	Discussion Topic
1/28/99	Project overview Draft EIS Work Plan CCCP
4/14/99	Project status Environmental studies update
6/29/99	Project status Tunneling techniques
10/14/99	Alignment alternatives Grand Central Terminal entrances and exits

Note: Does not include the 12 TAC meetings held during the MIS Phase.

Source: AKRF, Inc.

CITIZENS' ADVISORY COMMITTEE (CAC)

A Citizens' Advisory Committee was established to obtain a broad base of community input, formalized via regular meetings. The CAC includes members from affected community boards; representatives of environmental, civic, public interest, and transportation advocacy groups; members of business, labor, real estate, and economic development organizations; staff from organizations representing underserved populations and persons with specialized transportation needs; and other interested parties. The CAC was established by drawing on members of the CAC set up for the MIS phase of East Side Access, supplemented by additional interested parties. The CAC served as both a sounding board for the review of project issues and as the primary liaison between organizations interested in the project and the project team. Table 23-5 details the CAC meetings held through the end of November 1999. Additional meetings will be held throughout the duration of the project.

PRESENTATIONS ALONG THE PROJECT'S MANHATTAN ALIGNMENT

Because of the specific construction concerns along the proposed Manhattan tunnel alignment, the MTA/LIRR ESA project team have held a series of presentations to communicate with residents, workers, and building owners in this area.

Table 23-5

Citizens' Advisory Committee Meetings

Date	Discussion Topic
2/4/99	Project overview Draft EIS Work Plan CCCP
4/21/99	Project status Environmental studies update
6/30/99	Project status Tunneling techniques
10/26/99	Alignment alternatives Grand Central Terminal entrances and exits

Note: Does not include the 12 CAC meetings and tours held during the MIS phase.
Source: AKRF, Inc.

These small presentations allowed the project team to address the concerns of each group of stakeholders (commercial and residential building owners, commercial and residential building managers, commercial tenants, residential tenants, homeowners) with information tailored to their specific concerns. Each meeting included an overview of the project and the environmental studies being conducted, and also focused on the potential construction and operational impacts within specific geographic areas along the alignment. Table 23-6 lists the meetings scheduled to date.

Table 23-6

Targeted Outreach

Meeting Date	Location	Topic
November 3, 1999	521 Park Avenue Co-op Board	Project Impact
November 17, 1999	525 Park Avenue Co-op Board	Project Impact
To be scheduled	370 Park Avenue (Racquet & Tennis Club)	Project Impact
To be scheduled	390 Park Avenue (Lever House)	Project Impact
To be scheduled	400 Park Avenue	Project Impact
To be scheduled	50 Vanderbilt Avenue (The Yale Club)	Project Impact
To be scheduled	47 East 44th Street	Building Acquisition
To be scheduled	410 Park Avenue	Project Impact
To be scheduled	109 East 50th Street (St. Bart's Church)	Project Impact
To be scheduled	Sunnyside Gardens Association (Queens)	Project Impact
To be scheduled	General Motors Building (Queens)	Project Impact
To be scheduled	Waldorf Astoria Hotel	Project Impact

AGENCY COORDINATION

Coordination efforts with outside agencies and organizations have focused on reviewing methodologies for environmental and engineering studies, providing updates on the environmental analyses and design, and developing consensus on ways to minimize adverse impacts to rail and transit operations and environmental resources. Efforts have included establishing Rail and

Transit Working Committees and a Public Agency Task Force, and holding coordination meetings with various regulatory agencies with jurisdictional interest in the project.

RAIL AND TRANSIT WORKING COMMITTEES

Rail and Transit Working Committees were formed with each of the following agencies:

- LIRR
- Metro-North Railroad
- New York City Transit
- Amtrak
- NJ Transit
- New York & Atlantic Railway

Through these working committees, a network of liaisons between project team members and technically knowledgeable agency personnel was established. Meetings on technical issues and site visits have been held on an as-needed basis, arranged through the project/agency liaisons. The Working Committees also meet each month to evaluate conceptual design, resolve issues and review progress made on the project. Technical Working Groups were also formed to resolve technical issues and formally adopt plan elements. These groups meet regularly and are made up of experts from engineering, signals and communications, operations, and planning departments from each of the railroads.

PUBLIC AFFAIRS TASK FORCE

A Public Affairs Task Force (PATF) was created to include representatives from affected rail and transit agencies. The PATF has served as a resource for review of public outreach materials, coordination of meeting dates, and distribution of meeting notices (posters and seat drops). Members of the PATF include representatives from the Metropolitan Transportation Authority, Metro-North Railroad, Long Island Rail Road, New York City Transit, NJ Transit, and Amtrak. Meetings have been held throughout the course of the environmental review phase.

ENVIRONMENTAL AND REGULATORY AGENCIES

Environmental and other regulatory agencies met in January 1999 to review the scope of the studies prepared for this DEIS. Meetings were held with the New York City Department of Transportation to coordinate the proposed bridge reconstruction projects at Queens Boulevard and Honeywell Street. Meetings with the Queens Office of the New York City Department of City Planning were held to review plans for the new Sunnyside station. These meetings focused on the station's role in encouraging business growth in the Long Island City area in conjunction with commercial development as part of rezoning initiatives in the area. The project team has also coordinated extensively with staff at the New York State Department of Environmental Conservation (NYSDEC). NYSDEC has accompanied project team members on site visits to the areas of proposed construction activities and will continue to be consulted frequently on various environmental aspects of the project. The project has also been involved in ongoing coordination with the State Historic Preservation Office (SHPO) at the New York State Office of Parks, Recreation and Historic Preservation. SHPO has concurred with the methodologies that were followed for the historic and archaeological resource assessments, and has reviewed and commented on the results of those studies.

Public and agency outreach activities are scheduled throughout the EIS and design phase of the project. Emphasis will continue to be placed on creating dynamic open forums for the discussion of issues and exchange of information about the project.

INFORMATIONAL MATERIALS

In addition to the various public meetings held for the project, a range of printed informational materials were prepared. These allowed for a wide-scale distribution of information on the project, beyond what could be accomplished through face-to-face meetings.

Fact sheets on a variety of subjects were produced covering a range of topics, including general project information, ridership forecast and benefits, etc. The fact sheets were distributed at all meetings and mailed to approximately 600 people and organizations on the project mailing list.

A brochure and video have been developed to present the project to a wider audience. These materials are available for presentations, community boards, public information meetings, and public hearings.

D. CONTINUATION OF PUBLIC OUTREACH PROGRAM

Public outreach efforts will be continued throughout the engineering, construction, and testing phases of the project. Continuation of the public outreach program will include meetings, presentations, informational material, and continuing dialogue with all affected and interested parties.

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B. LIST OF SUPPORTING DOCUMENTATION

TEXT TO COME

Chapter 25: List of Agencies and Organizations

TO FOLLOW

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This document was prepared by the Metropolitan Transportation Authority (MTA), a New York State public benefit corporation, under the direction of and with active involvement from the U.S. Federal Transit Administration (FTA). Key individuals and firms involved in the preparation of the EIS are indicated below.

FEDERAL TRANSIT ADMINISTRATION

Letitia Thompson, FTA Region II, Regional Administrator
Anthony G. Carr, FTA Region II, Deputy Regional Administrator
Steven F. Faust, A.I.C.P., FTA Region II, Planning and Program Manager
Maisie Grace, FTA Region II, Regional Counsel
Irwin B. Kessman, FTA Region II, Planning Director

MTA

Anthony Japha, Chief Program Executive, East Side Access
Howard Sackel, Deputy Chief Program Executive, East Side Access
Joseph Petrocelli, Chief Finance and Administration
Roberta Bender, Special Counsel
Pamela Burford, Director, Planning & External Relations, East Side Access
Mike Kaleda, Chief Design, Construction & Railroad Operations, East Side Access
Robert Magnifico, Chief Engineer, East Side Access
Susan Jurman, Director of Budgets

CONSULTANT TEAM

AKRF INC.—ENVIRONMENTAL ENGINEERS

Debra Allee, A.I.C.P., Principal-in-Charge
Robert F. Conway, P.E., EIS Project Manager
Julia P. Cowing, A.I.C.P., EIS Deputy Project Manager
Ethan Goodman, EIS Assistant Deputy Project Manager
Stephen S. Rosen, Ph.D., Noise and Vibration
Shabana Tajwar, Air Quality and Energy
Marcus Simons, Hazardous Materials
Claudia Cooney, Historic and Visual Resources
Dennis R. Mincieli, Economic Conditions

ACENTECH INCORPORATED—VIBRATION

David E. Coate, Director, Vibration Analysis
Jeffrey A. Zapfe, Ph.D.

ENG-WONG TAUB & ASSOCIATES—TRAFFIC AND TRANSPORTATION

Marty Taub, P.E., Traffic and Parking
Steven Scalici, P.E., Passengers and Pedestrians

KPMG PEAK MARWICK LLP—RIDERSHIP FORECASTING

William Woodford, Travel Demand Forecasting

HISTORICAL PERSPECTIVES, INC.—ARCHAEOLOGY

Betsey Kearns, R.O.P.A.
Cece Saunders, R.O.P.A.

HOWARD/STEIN-HUDSON ASSOCIATES—PUBLIC OUTREACH

Arnold J. Bloch
Marilyn Gay

ROBINSON SILVERMAN PEARCE AROSOHN & BERMAN LLP—ENVIRONMENTAL LEGAL COUNSEL

Kevin Healy
Roberta Gordon

BECHTEL INFRASTRUCTURE CORPORATION AND URS GREINER WOODWARD CLYDE JOINT VENTURE—PROGRAM MANAGEMENT

George B. Morschauser, P.E., Program Manager
Albert J. Bast, P.E., Deputy Program Manager
Gareth Rees, P.E., Systems Engineering Consultant Manager
Sterling Brisbin, P.E., Tunnel Engineering Consultant Manager
Raymond Tillman, Environmental Consultant Manager
Audrey Heffernan, A.I.C.P., Environmental Consultant Coordinator
Tanya R. Freeman, Environmental Engineer

SYSTRA CONSULTING INC.—SYSTEMS INTEGRATION AND RAIL OPERATIONS

Peter Allibone, Deputy Project Manager, Operations
Kirk Hunt, Project Engineer
Davis Dure, Operations Planning

PARSONS BRINCKERHOFF QUADE & DOUGLAS, INC AND STV INCORPORATED JOINT VENTURE—TUNNEL ENGINEERS

Jerry Forman, Project Director, Tunnel Engineers
Margarita Gagliardi, Deputy Project Director, Tunnel Engineers
Joe Marchese, Deputy Project Director, Facilities
Nasri Munfah, Deputy Project Director, Chief Engineer

PARSONS TRANSPORTATION GROUP INC.—SYSTEMS ENGINEERS

Richard Tansill, Project Manager
Steve LaRocco, Manager, Design Integration

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Chapter 27: Glossary

A-weighting	The system of modifying measured sound pressure levels to simulate the actual response of the human ear to different sound frequencies.
Accessibility	A measure of the ability or ease of all people to travel among various origins and destinations.
ACM	Asbestos-containing material.
ADA	Americans with Disabilities Act.
ADA compliant passageway	Pedestrian corridor constructed to comply with design standards established in the Americans with Disabilities Act.
Advisory Council on Historic Preservation	An independent Federal agency established by the National Historic Preservation Act of 1966 to advise the President and Congress on historic preservation matters. It reviews policies and programs of Federal agencies to improve their consistency with NHPA purposes, and administers and participates in the preservation review process established by Section 106 of the NHPA. Under Section 106, federal agencies must seek the Council's comments prior to carrying out, approving financial assistance to, or issuing a permit for a project that may affect properties listed or eligible for listing on the National Register of Historic Places.
Air pollution	The presence of unwanted material in the air in sufficient amount and under such circumstances as to interfere significantly with human comfort, health, or welfare, or with full use and enjoyment of property. National and state ambient air quality standards identify pollutant concentrations not to be exceeded over a specified time.
AM peak period	Peak morning travel period (usually from 6 AM to 10 AM).
Ambient air quality	A physical and chemical measure of the concentration of various pollutants in the outside air, usually determined over a specified time period (e.g., 1 hour, 8 hours).
Ambient Noise Level	The total noise level in the acoustical environment, excluding the proposed project.

Area of Potential Effect (APE)	The geographic area within which a project my have a direct or indirect effect on historic or archaeological resources, if any are present.
Arterial	Streets that serve primarily through traffic and provide access to abutting properties as a secondary function.
As-of-right	Development that could occur on a parcel of land under existing zoning and without the granting of additional approvals.
AST	Above ground storage tank.
At-grade crossing	The point of intersection between a rail line and roadway, road, or pedestrian crossing that occurs along the same surface plane.
Bathtub	An enclosed excavation that extends down to the rockline, below the water table allowing de-watering to take place within its walls without causing a draw-down of the water table into the excavation or movement of the groundwater outside its walls.
Bellmouth	The area of a railroad tunnel where the end widens to allow tracks to diverge.
Bi-level Coaches	Passenger-carrying rail cars which allow seating on upper and lower levels.
BID	Business Improvement District.
Blissville Yard	Rail yard located approximately 1 mile southwest of Sunnyside Yard, in Blissville, Queens, lying east of Dutch Kills and north of Newtown Creek, at the point where the Montauk cutoff originating from Sunnyside Yard meets the Montauk Branch. It consists of six tracks, with no physical track connection to the Montauk Branch, which parallels the yard to the north.
BTEX	Benzene, toluene, ethylbenzene, and xylene - VOC's common constituents of gasoline.
Build year	Typically the first year of operation of the project used to assess impacts; 2010 is the Build year for this project.
CAAA	Clean Air Act Amendments of 1990 (see below).
CAL3QHC model	Mathematical dispersion model for simulation of carbon monoxide concentrations near roadway intersections.
Capacity	The physical ability of a transportation system, or any of its elements, to carry travelers from one point to another.

Capital costs	The cost of designing, constructing, purchasing equipment (e.g., vehicles), and implementing a transit system.
Catenary power system	An electric power system and overhead contact wire that is supported from one or more longitudinal wires or cables used to provide a power source for vehicles via a pantograph (contact mechanism) on the roof of the vehicle.
CBD	Central business district (see below).
CCCP	Comprehensive Communications and Coordination Plan; the plan developed to guide East Side Access's public participation program.
Central Business District (CBD)	The primary downtown area of a city, or an area of concentrated retail activity. Also characterized by high land valuation and traffic flow.
CEQR	City Environmental Quality Review, the local New York City law set forth by Executive Order No. 91 of 1977, governing environmental review for actions undertaken by New York City agencies.
Citizens Advisory Committee (CAC)	Representatives from a number of elected officials' offices and other interested parties that serve as a reviewing body of project issues and primary liaison between organizations interested in the project and the project team.
Clean Air Act Amendments of 1990	A federal law enacted in 1990 that places new federal controls on all sources of air pollution and places new emphasis on regional transportation planning. The CAAA includes an implementation strategy and establishes air quality improvement requirements.
CMS	Congestion Management System.
CO	Carbon monoxide.
Coastal Zone	A geographic area of New York State's coastal waters and adjacent shorelines, generally including islands, tidal wetlands, beaches, dunes, barrier islands, cliffs, bluffs, estuaries, flooding- and erosion-prone areas, port facilities, and other coastal locations.
COE	United States Army Corps of Engineers
Contra-flow lanes	Highway lanes carrying traffic in the opposite direction of other traffic on the same side of the highway.

Controlled Blasting	A specialized construction technique used to excavate rock. Numerous small holes are drilled into the rock and small explosive charges are placed into the holes. The charges are detonated in a delayed sequence which precisely breaks the rock and minimizes unwanted vibration and noise effects.
CPC	New York City's City Planning Commission.
Cut-and-Cover	A method of excavation whereby the construction takes place from the ground surface. Once the excavation reaches a certain depth, the open cut can be covered with a steel or concrete plate to enable traffic or pedestrians to traverse the excavation.
CZMA	Federal Coastal Zone Management Act.
dB	Decibel, a unit of sound level.
dBA	A-weighted decibel. A sound pressure level that incorporates the human ear's sensitivity to pitch.
DCP	New York City Department of City Planning.
De minimis criteria	The minimum incremental increase in 8-hour average carbon monoxide levels that constitutes a significant adverse air quality impact as defined by New York City.
DEC	New York City Department of Environmental Conservation.
Decibel	The unit for measuring noise, which is 10 times the logarithm of the ratio of the sound pressure squared to a standard reference pressure squared.
DEIS	Draft Environmental Impact Statement.
DEP	New York City Department of Environmental Protection.
Determination of Eligibility	The decision of the State Historic Preservation Officer (SHPO) on whether properties or resources are eligible for the State and/or National Register of Historic Places.
DOI	United States Department of the Interior.
Dual-mode locomotives	Locomotives that can be powered using either diesel fuel or electricity from the third rail.
Dwell time	The time when a train is fully stopped in a station.
EIS	Environmental Impact Statement.
Federal Transit Administration (FTA)	The federal department of mass transportation. Administratively, it is under United States Department of Transportation (USDOT).
FEIS	Final Environmental Impact Statement.

FEMA	Federal Emergency Management Agency.
FIRE	Finance, Insurance, and Real Estate.
Flexibility	The adaptability of a transportation system to accommodate the travel demands within the system if one component of the system fails, and its ability to accommodate future growth.
Floating Slab	The addition of a second floor slab that is isolated from the first slab by resilient elements which can be used to attenuate the transfer of vibration from a tunnel to the building above.
Floodplain	The lowlands adjoining the channel of a river, stream, or watercourse, or ocean, lake, or other body of water, which have been or may be inundated by floodwater (as established by the National Flood Insurance Act).
Fresh Pond Yard	Rail yard located in Glendale, Queens, at the junction of the LIRR Montauk Branch and the Conrail Connector to the LIRR Bay Ridge Branch. The yard consists of two smaller yards—a West Yard and an East Yard separated by the NYCT "M" subway line.
FWS	United States Fish and Wildlife Service.
GCT	Grand Central Terminal.
Groundwater	The water contained beneath the surface in soils and rock.
Harold Interlocking	The 1.5-mile stretch of track, and its associated switches and crossovers, providing access to and from the East River Tunnels for LIRR's Main Line and Port Washington branch and Amtrak's Northeast Corridor trains heading north to and from New York City.
HASP	Health and Safety Plan.
Hazardous waste	A substance, as defined under the federal Resource Conservation and Recovery Act, that is chemically reactive, ignitable, corrosive, or toxic.
Highbridge Yard	Rail yard located in the Highbridge section of the Bronx, between the Harlem River and the Major Deegan Expressway. It consists of a rail yard used by Metro-North Railroad and two sets of tracks used by Metro-North's Hudson Line.
High Density Interlocking System	An area where a number of separate rail tracks connect via switches, turnouts, and integrated signaling systems, allowing trains to switch from one route or track, to another.

HOV (High Occupancy Vehicle)	A vehicle carrying two or more passengers (for example, a bus, vanpool, or carpool). HOVs are encouraged as a means of decreasing vehicle miles traveled (VMTs). May also be referred to as Multi-occupancy Vehicle (MOV).
Infrastructure	The physical support network—such as roads, railroads, and utilities—of a given geographical area.
Interlocking	The segment of track which consists of a series of switches and signals which enable trains to access different routes or platforms.
Intermodal transfer	A transfer from one mode of transportation (such as auto, taxi, bus, and walking) to another.
ISTEA (Intermodal Surface Transportation Efficiency Act)	Legislation enacted by Congress in 1991 that makes funds available to aid metropolitan areas throughout the United States in the development of transportation systems that are not harmful to the environment and will bring metropolitan areas into compliance with the Clean Air Act.
ITS	Intelligent Transportation Systems.
Jet grout	Jet Grouting for soil stabilization involves drilling pilot holes down from the MNR track level, and then injecting under pressure a mixture of cement, water and air into the soil via injection rods inserted into the pilot holes. As the rods are withdrawn, they are rotated, resulting in a series of columns consisting of a soil and cement grout mixture hardened to a strength suitable to stabilize the soil, thereby allowing construction to occur underneath.
John F. Kennedy International Airport Light Rail System (JFK LRS)	The system currently under construction at John F. Kennedy International Airport that will consist of electrically powered vehicles that will operate on elevated tracks in a 2-mile loop around the airport.
L_{dn}	An average sound level over the entire day where the nighttime hours are weighted more than those during the daytime.
L_{eq}	Equivalent sound level, or an energy average sound level, usually specified over a period of time. This is the constant sound level that, in a given period, conveys the same sound energy as the actual time-varying sound.

Level of service (LOS)	A set of descriptive characteristics used to indicate the quality of transportation service provided, including characteristics that are quantifiable (e.g., frequency, travel time, vehicle delay). Levels of service are usually qualified with letter designations, ranging from "A" (LOS A) with the least amount of congestion to "F" (LOS F) with the greatest amount.
Lexington Avenue Line	The numbers 4, 5, and 6 subway routes that provide full north-south rapid transit service to Manhattan's East Side, Brooklyn, and the Bronx.
Line Haul Capacity	The number of trains and their passenger capacity that can pass through a given point in the system.
LIRR	Long Island Rail Road.
Long Island Transportation Corridor (LITC)	A large, varied metropolitan subregion, stretching for approximately 122 miles east-west, from the Hudson River to the tip of Montauk Point.
L_{max}	Maximum instantaneous sound level.
LPC (or NYC LPC)	Landmark Preservation Commission of New York City.
LUST	Leaking underground storage tank.
M-1, M-3, and M-7 Cars	Electric-powered multiple unit cars used in Metro-North Railroad and Long Island Rail Road service. Multiple unit cars are electric cars that have their own propulsion systems and can be controlled from an engineer's cab in a train. The M-7 will be LIRR's new generation car.
Madison Yard	The western side of the lower level of GCT, used by Metro-North Railroad for maintenance and storage.
Maspeth Yard	Rail yard located in Maspeth, Queens, near the intersection of Rust Street and Maspeth Avenue, used by NYAR and two active LIRR Montauk Branch mainline tracks. The yard consists of four rail car storage tracks parallel to the mainline tracks, about 60 feet south of the mainline.
MAS	Maximum Authorized Speed which is analogous to a speed limit on a rail right-of-way.
MCTA	Metropolitan Commuter Transportation Authority.
Muck	Material that is excavated following the tunnel boring process.

Mined Excavation	A method of constructing tunnels or other underground spaces from below the surface. Unlike cut-and-cover construction, the ground surface is not disturbed with this technique. The mining may be accomplished in a number of ways including drilling with controlled blasting, tunnel boring machines or other methods of rock/soil excavation.
MIS	Major Investment Study.
Mitigation	Measures designed to lessen or eliminate the adverse impacts resulting from a proposed project or action.
MNR	MTA Metro-North Railroad.
Mobile source	Vehicular sources of air pollution, such as automobiles, trucks, and buses.
MOBILE5B	Vehicle emissions simulation model developed by the Environmental Protection Agency.
Mode	The form of travel (e.g., walking, automobile, bus, train).
MTA	Metropolitan Transportation Authority.
NAAQS (National Ambient Air Quality Standards)	Standards established by Congress under the Clean Air Act for six major air pollutants (carbon monoxide, nitrogen oxides, photochemical oxidants or ozone, inhalable particulates, sulfur dioxide, and lead). These are also New York State's air quality standards.
National Register of Historic Places	The federal list of buildings and sites determined to have historic significance, established by the National Historic Preservation Act.
National Historic Preservation Act of 1966	Statute enacted by Congress establishing a nationwide policy to support and encourage the preservation of prehistoric and historic resources and to direct Federal agencies to assume responsibility for considering such resources in their activities. Section 106 does not mandate preservation of such resources but requires Federal agencies to consider the impact of actions on historic properties listed or eligible for listing on the National Register of Historic Places.
NEPA	National Environmental Policy Act; federal legislation enacted to require federal agencies to evaluate the environmental consequences of proposed actions and their alternatives, to identify measures to mitigate any significant adverse impacts, and to conduct the entire process in coordination with other agencies and the public.
NFPA	National Fire Protection Association.
NHL	National Historic Landmark.

No Action Alternative	Those improvements in the city's transportation system after 1999 (the base year of the MTA/LIRR ESA study) that would be in place by the year 2010 or 2020 without implementation of any of the options identified by MTA/LIRR ESA.
NO_2	Nitrogen dioxide; an air pollutant and precursor to ozone.
NOAA	National Oceanic and Atmospheric Administration.
Non-attainment area	The United States Environmental Protection Agency's classification for an area or region where federal ambient air quality standards are not being met.
NO_X	Nitrogen oxides; a group of air pollutants that contribute to the formation of ozone.
NR	National Register of Historic Places (see above).
National Wetlands Inventory (NWI)	Established by the U.S. Fish and Wildlife Service to generate information about the characteristics, extent and status of the Nation's wetlands and deepwater habitats. NWI maps show the location and classification of wetlands throughout New York State.
NWP	United States Army Corp of Engineers nationwide permit program.
NYAR	New York & Atlantic Railway.
NYCDEP	New York City Department of Environmental Protection.
NYCDOT	New York City Department of Transportation.
NYCRR	New York Codes, Rules and Regulations.
NYCT	MTA New York City Transit.
NYMTC	New York Metropolitan Transportation Council (the MPO).
NYSDEC	New York State Department of Environmental Conservation.
NYSDOS	New York State Department of State.
NYSDOT	New York State Department of Transportation.
NYSM	New York State Museum.
Off-peak period	The periods of the day that are not during the peak travel periods.
OPRHP	New York State Office of Parks, Recreation and Historic Preservation.

Option 1	Engineering Option 1 of the Preferred Alternative, which would bring new LIRR service into Grand Central Terminal via the existing 63rd Street Tunnel and a new tunnel beneath Park Avenue. At GCT, new tracks and platforms and passenger facilities would be located in the western portion of GCT's existing lower level.
Option 2	Engineering Option 2 of the Preferred Alternative, which would bring new LIRR service into GCT via the same route as in Option 1 (see above). At GCT, new tracks and platforms would be created approximately 75 feet beneath the existing lower level of GCT, with a passenger mezzanine in the western portion of GCT's existing lower level.
Ozone	An unstable form of oxygen formed by a photochemical reaction of atmospheric gases with solar ultraviolet radiation. While a valuable component of the upper atmosphere, it is a harmful air pollutant in the lower atmosphere and contributes to the formation of smog.
Polycyclic aromatic hydrocarbons (PAH)	Polycyclic aromatic hydrocarbons are a class of Semivolatile Organic Compounds (SVOCs) associated with combustion (e.g., coal, ash, petroleum) and have historically been used as fill throughout New York City. Exposure to PAHs can pose long-term risks to human health.
PANYNJ	Port Authority of New York and New Jersey.
Particulate matter	Airborne particles consisting of a variety of materials such as dust, soot, and aerosols.
PATF	Public Affairs Task Force.
PATH	Port Authority Trans Hudson.
Polychlorinated biphenyls (PCB)	A class of Semivolatile Organic Compounds (SVOCs), which were commonly used in (train-mounted or other) electrical equipment, especially transformers. Exposure to PCBs can pose long-term risks to wildlife and human health.
PCE	Passenger Car Equivalent.
Peak period	The period during which the maximum amount of travel occurs. It may be specified as the morning (AM), afternoon/evening (PM) peak, or hourly. It is the period when demand for transportation services is the highest.
PM peak period	The afternoon rush hours, approximately 4 to 7 PM.
PM_{10}	Particulate matter of 10 microns or less. Particulates of this size are small enough to be respirable.

$PM_{2.5}$	Particulate matter of 2.5 microns or less. Particulates of this size show consistent and coherent associations with severe health effects.
ppm	Parts per million.
PSRC	Pennsylvania Station Redevelopment Corporation.
Receptor site	Location to which the public has access on a more or less continuous basis used for air quality predictions; or a defined area where human activity may be adversely affected when noise levels exceed predefined thresholds of acceptability or when levels increase by predefined thresholds of change, used for noise analyses.
Resilient Fasteners	Special fasteners which are used to connect the steel rail to the railroad tie which helps to attenuate the vibration effects of the train into the surrounding ground surface.
Ridership volume	Total number of passengers riding trains regardless of the seated capacities of the trains.
Right-of-way	A corridor of land acquired by reservation, dedication, prescription, or condemnation, and intended to be utilized as a road, rail line, utility service, buffer, or similar use.
RTP	Regional Transportation Plan.
S/NR	State and National Registers of Historic Places.
Scoping	The process of defining the studies to be undertaken for an Environmental Impact Statement.
SEQRA	New York State Environmental Quality Act. State legislation similar to NEPA, requiring state agencies to examine the environmental effects of their discretionary actions.
Seated Capacity	The maximum number of passengers that can be accommodated on trains without exceeding the number of seats.
SEL	Sound Exposure Level.
SHPO	State Historic Preservation Office (see below).
SIP (State Implementation Plan)	The Clean Air Act requires each state to demonstrate in a SIP the manner in which it will attain compliance with the National Ambient Air Quality Standards for a given air pollutant.
SO_2	Sulfur dioxide; an air pollutant mainly associated with the combustion of sulfur-containing fuels such as oil.

State Historic Preservation Office (SHPO)	The state administrative agency responsible for compliance with historic preservation rules, laws, and regulations.
State Register of Historic Places	The state list of buildings and sites determined to have historic significance, established by the New York State Historic Preservation Act.
SVOC	Semi-volatile organic compound; organic compounds which exhibit some evaporation under normal circumstances.
TCLP	Toxicity Characteristics Leaching Procedure. A laboratory test used to determine the hazardous characteristics of a solid waste or soil.
TDM	Travel Demand Management.
TEA-21	Transportation Equity Act for the 21st Century, adopted in May 1998. This federal legislation re-authorizes and amends ISTEA, which was adopted in 1991.
Technical Advisory Committee (TAC)	Representatives on the federal, state, and local level that serve as liaisons to their respective organizations on technical matters relating to the evolution of the project.
Third Rail	An electric conductor rail located alongside the running rail from which power is collected by means of a sliding contact shoe attached to the truck of electric equipment.
Third Rail Shoe	An insulated metallic sliding contact, mounted on the truck of an electric locomotive or car, for collecting current from the third rail. Positive contact between shoe and rail is maintained by spring tension.
Throat track	The convergence area of several tracks in a multi-track sequence, where the majority of the tracks merge to form a single track.
TIP	Transportation Improvement Program (see below).
TRACKS System Safety Program	The Long Island Rail Road's program designed to address potential increases in accidents near at-grade crossings—"Together Railroads and Communities Keeping Safe."
Trainset	A group of train cars joined together (as opposed to a single train car).
Transfer mobility	The measure of the efficiency of vibration transmission through the ground, offering a means of predicting train and construction-induced vibration levels in buildings prior to project construction.